The River Seine.*

BY LEVESON FRANCIS VERNON-HARCOURT, M. A., M. INST. C. E.

(*Concluded from Page 62.*)

CORRESPONDENCE.

MR. L. PARTIOT, having been for nine years in charge of the embankments of the tidal Seine, had had opportunities of carefully studying the question. He had noticed that when the estuary of a tidal-river, of which the bottom was sandy, was separated from the open sea by a narrow strait, there was produced in the latter a great depth of water, which did not shoal immediately above or below the narrows, but formed channels extending to a considerable distance on either side. He cited in his memoir the outfalls of the Gironde, of the Scheldt, of the Tagus, and of the Mersey, and added that these interior estuaries, which formed in advance of the actual outfalls, remained unchanged for centuries, without being silted up either by the river or by the sea. This rule, was equally applicable to bays, such as those of Arcachon and Poole, which only received very small streams. He thus explained this law: When a mass of water, which entered into and retired from a bay passed through a very narrow entrance-channel in a soft bottom, the velocity of the current was augmented, and equilibrium between the bottom-velocity and the resistance of the bed could only be established by a deepening of the latter, varying in extent with the amount of discharge and the width of the channel. The sand in the estuary above was brought down by the ebb through the trench thus produced, and there were formed, by the propagation of this movement, one or several channels, of which the dimensions were dependent on the amount and the duration of the ebb-tide. An analogous cause acted to form, by the flood-tide, a similar channel below the estuary. The sands, thus definitively displaced by the formation of the channels, were deposited in banks above or below the estuary-mouth. In the long extent comprised between the origin of the estuary-channel and its disappearance seaward, the currents did not allow stones, sand, or silt to become stationary. They moved up and down, and when the river was of such extent as materially to add by its discharge to the volume of the ebb, they were finally carried out to sea.

MR. H. T. H. SICCAMA.—Another great point for consideration in estuary-works was the direction in which the tidal-wave approached the coast, as the deepest passes across a bar lay, as a rule, in what might be called "scooping on the tide." This might be seen by a glance at the North Sea chart of the Dutch coast for instance. Here the tidal-wave, coming up from the channel with an average current of three miles an hour approached the estuaries of the Scheldt, the Maas, and the Rhine, and the narrows of Texel and Vlieland, in a direction from the south-west to the north-east, and all the deepest passes across the bars opened up against the south-west.

The great scouring agent in these passes was the current of the rising tide, the velocity of which was not due only to gravity or to the head between high-and low-water, as the current continued to flow for a time at any place after the top of the tidal-wave had passed that place. Nothing should be done tending to check this current by suddenly narrowing the bed or deflecting, the direction as in this case the living force was broken, and only the current due to head was left. The ploughing up of the channels was done by the rising tide, and the sand or silt thus lifted was carried out to sea by the ebb-tide. The unsatisfactory results of the works at the new waterway at the mouth of the Maas was due to losing sight of this fact in devising the intended improvement. This entrance opened at right angles, or nearly so, to the direction of the littoral current, which, therefore, instead of rushing up the estuary in nearly its original direction, swept by, while only a portion of the tidal-wave entered the river mouth. The position of the jetties at the mouth, too, caused great disturbance in the current, which formed continually-shifting pools and tortuous channels, which would not have occurred had their heads been parallel or tangential to its direction. In the Seine, the influence of the littoral current would probably be less than in the case just mentioned, as Havre and Honfleur were situated in a bay; but the tidal-wave coming round Point Barfleur would set up a current which must be of importance for scouring purposes.

MR. W. H. WHEELER.—From the fact that the estuary had deepened below Havre, it would seem as if a portion of the sand which had oscillated between the upper and lower part of the estuary had now become fixed in the upper part, and the estuary to this extent permanently improved. In this, as in all other similar estuaries, there was a large mass of sand lying about the entrance which was driven in occasionally by storms, to be washed out again by the ebb-current. Although, no doubt, the actual power of the waves and of the tidal-current to move sands was greater than the ebb, yet, taken continuously, the ebb-current must have the greatest effect, as not only had all the tidal-water poured into the estuary and up the channel of the river to return again, but in addition there was the fresh water from the drainage of a very large area of land, this ebb-current having also the aid of gravity to assist it in carrying the deposit outwards. There was also a large mass of moveable sand in the estuary through which the channel appeared to alter its course from time to time, owing to the prevalence of wind from one particular quarter, or to the influence of long-continued floods. The strength of the ebb-current was dissipated in moving these sands and forming new channels. If instead of having to move these sands laterally, the whole energy of the flood and of the ebb-currents were concentrated in one fixed channel, their force would be employed in scouring and deepening it, and thus improving the low-water channel and giving greater navigable depth at high-water. Any loss of scour due to the decrease in the tidal-capacity would then be more than compensated.

For the benefit of the navigation of the lower estuary, it was no doubt desirable to continue the training-works as originally intended, and so fix a deep-water channel in one course, and there would not seem to be any insuperable difficulty in doing this so as not to insure the channels either to Havre or to Honfleur. There was every possibility that they might be deepened and greatly improved. The line of training recommended by the author seemed open to the objection that owing to the convex form of the proposed north training-wall, the current would pursue a course along the south side and so away from Havre. The line laid down by Mr. Lemire seemed best adapted for serving both Honfleur and Havre. The partially concave line of wall on the north side would probably draw the flood-tide along it, and the ebb would then return along the same course as being the deepest channel. It would be better perhaps if the concavity were continued further on to opposite Honfleur, and to let the concavity meet the ebb-current nearer the more confined channel. By thus bringing the influence of the ebb-current to bear more directly on the channels past Honfleur and Havre, a deep and stable channel would be maintained, and the zone of sands which now existed in the centre of the estuary as a movable mass, would remain fixed in one position.

MR. VERNON HARCOURT.—The chief criticisms had been directed to the training-walls, which formed the most interesting of the Seine works, because the most uncertain in their results. Though the criticisms differed greatly, he thought that they were valuable as representing every phase of opinion which might be considered in deciding on the question. Whenever the training-walls were extended, fresh accretions must occur behind them; and the difficulty consisted in devising such a scheme that the training-walls should be near enough together to improve the channel down to deep water without unduly restricting the tidal flow. Some engineers objected to training-works as injurious to the tidal capacity of estuaries, which would put a stop to their improvement; whilst others would place them close together to insure a deep fixed channel, which would greatly reduce the tidal flow, and produce a sudden change of velocity of the current at the outlet. The object of this suggested extension was to enforce, rather than to impede, the influx of the tide, whilst regulating and improving the channel in the neutral zone where the influences of the flood and ebb were irregular and deficient.

The total estimate for this comprehensive project was £6,706,000, but it was anticipated that of this sum £4,236,000 would be obtained by the sale of reclaimed land behind the training-walls, thus reducing the total sum to £2,470,000. These projects differed so greatly from each other that no better instance could be given of the diversity of opinion that existed in France as to the best means of improving the port of Havre. Moreover, this important question could never be separated from that of improving the estuary of the Seine, when the latter subject was under discussion, and therefore the port of Havre had been somewhat prominently referred to in his remarks on the author's valuable paper on the river Seine.

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How American Railroads are Built.

At Roseland Park, Woodstock, Conn., July 5th, Henry Clews, the Wall street banker and broker, delivered an address on "Railroad Methods." After explaining how the company is incorporated to build a railroad, he said:

The incorporators then proceed to form themselves into a syndicate or company for the purpose of contracting to build and equip the road. Here comes the first step in the system of "crooked" financiering. In their capacity of incorporators, the same men make a contract with themselves, in the capacity of constructors. Of course, they do not fail to make a bargain to suit their own interests. They would be more than human if they did. Usually the bargain is that the construction company undertakes to build the road for 80 to 100 per cent of the face value of the first mortgage bonds, with an equal amount of stock, and sometimes also a certain amount of second mortgages thrown in, virtually without consideration. The first mortgages are supposed to represent the real cash outlay on the construction and equipment; but, as a matter of fact, the true cash cost of the work done and materials furnished ranges from 60 to 80 per cent. of the amount of first lien transferred to the constructors. The construction company disposes of the bonds, partly by negotiating their sale to the public through bankers, at an advance upon the valuation at which they had received them, and partly by using them in payment for rails and equipment. Beyond the profits made from building the road for the first mortgage bonds there remain in the hands of the constructors the entire capital stock and any second mortgage bonds they may have received, as a clear bonus, to be held for future appreciation, and to keep control of the company and be ultimately sold on a market deftly maintained for that purpose.

This is the way in which a large majority of our railroads have been and still are constructed. It will thus be seen that the actual cost of a railroad is ordinarily less than 50 per cent. of the stock and bonds issued against the property, and that its first mortgage exceeds the amount of the legitimate actual cost of the road.

The profits realized on these speculative constructions are enormous, and have constituted the chief source of the phenomenal fortunes piled up by our railroad millionaires within the last twenty years. It is no exaggeration to characterize these transactions as direct frauds upon the public.

Speaking of the pooling system and its evils, Mr. Clews said:

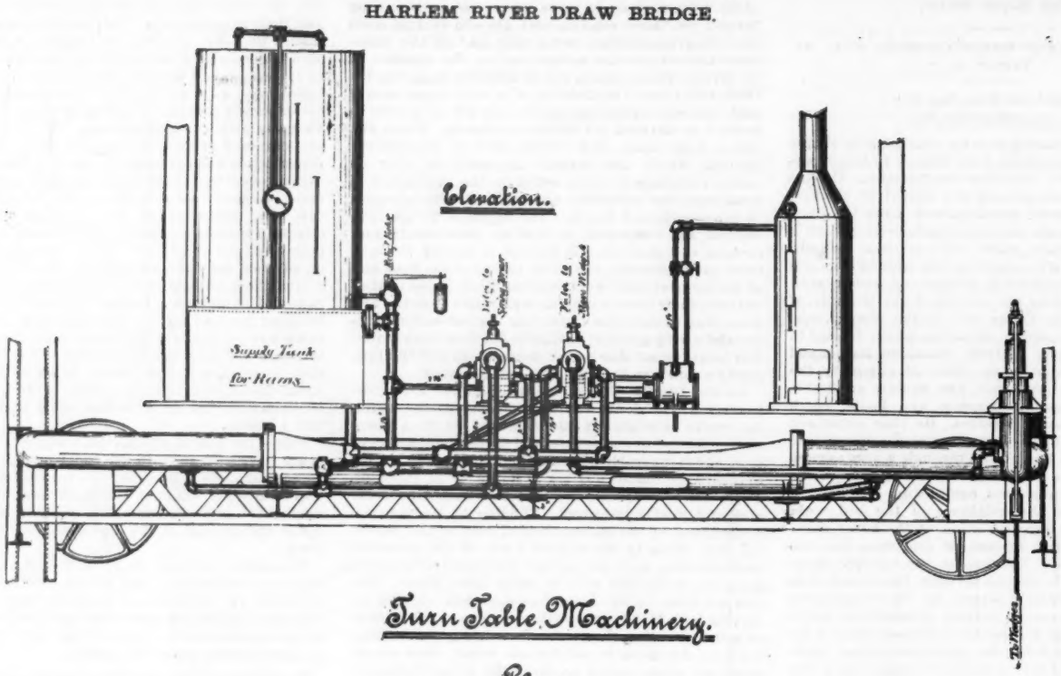
As roads running between the same points were multiplied competition for "through" business became more active, until not only were dividends threatened on some of the best lines, but some roads were driven into default on their mortgages. At this point the "pool" was introduced—a device by which all lines running between the same points agree to put their business from through traffic into a common aggregate, to be distributed among the several members according to certain accepted percentages. It was hoped that in this way uniformity of charges could be maintained at such rates as were necessary to make the business satisfactory to each member. This, however, was soon found to be a step "from the mud into the mire." The pool was discovered to operate as a premium on the construction of new parallels. The recent fate of the "Nickel-Plate" and several others of these parallel roads built for speculation, by which nearly 1,000 miles of needless road was built to divide traffic with the Vanderbilt system, serves as a warning against the danger of building roads to live upon pool support; but, nevertheless, the Eastern trunk pool still stands exposed to a great deal of harassing outside competition from possible and contemplated new combinations of existing detached lines. Routes of the latter kind are even more formidable competitors than new lines, because they can be provided at a lower capitalization and have already the support of an established way traffic. It would not be surprising if within the next three or four years as many new routes were in this way established between New York and Chicago.

Mr. Clews concluded as follows:

In order to prevent wrongful speculative profits from being realized by the incorporators they should be prevented from becoming the constructors of their road, directly or indirectly, and all contracts for construction, equipment, extensions, or improvements should be made upon open competitive bids, the lowest bid to be accepted, with substantial guarantees for the faithful performance of the contract. Also, it should be made the duty of Boards of State Railroad Commissioners to see to it that all these conditions are strictly complied with. Regulations should be provided prohibiting issues of stock for any other than construction or equipment purposes, forbidding the payment of dividends not actually earned, and enforcing the amplest publicity of details relating to current traffic and the financial affairs of the companies.

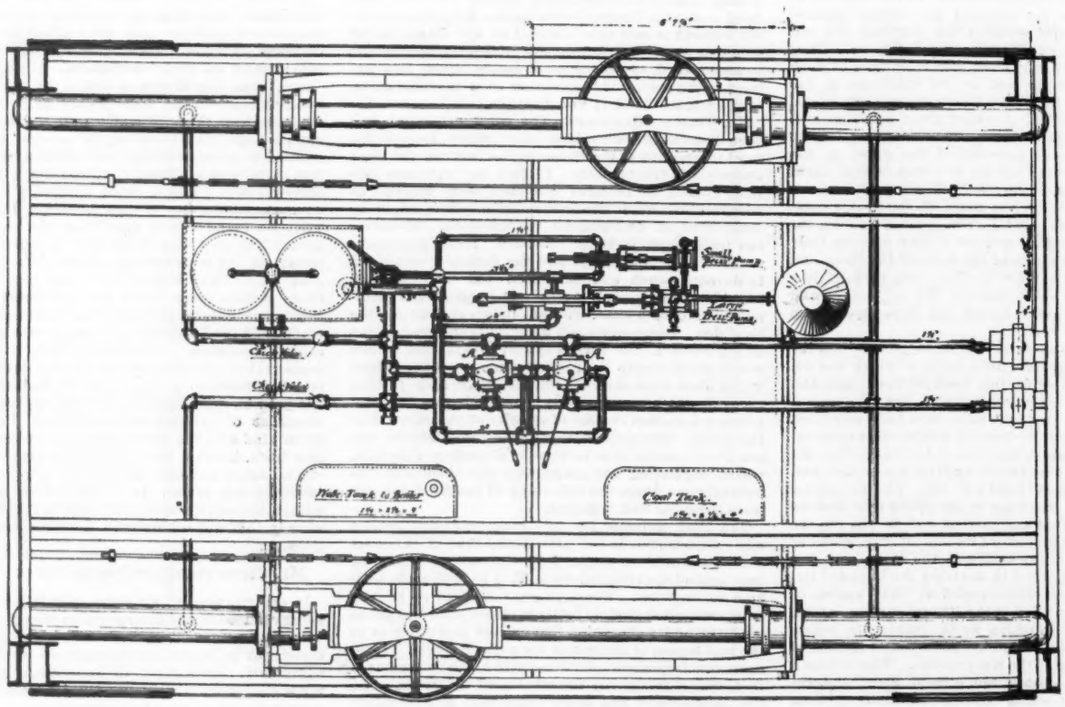
KRUPP'S NEW GUNS.—Krupp, of Essen, has just completed two giant guns, intended for the defence of Pola. The length of each cannon is 34.1 feet, the diameter at the bottom 4.75 feet, and at the mouth 2 feet. The transport of the guns to Pola from Essen will cost $1,450. For the conveyance of the ordnance two special wagons with eight axles have had to be built, the length being 33.8 feet, the weight 39, tons and the capacity 75 tons.

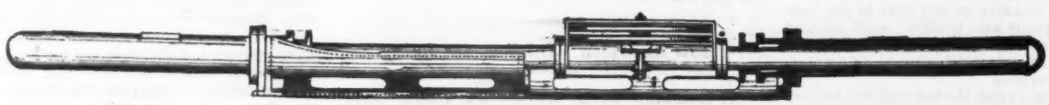
HARLEM RIVER DRAW BRIDGE.



Turn Table Machinery.

Plan.





SIDE ELEVATION

Rams for Turning Draw. Scale ¼ inch to 1 foot.

LONGITUDINAL SECTION.

Harlem River Bridge. Suburban Rapid Transit Co.—Specifications.

The bridge shall be built according to the drawings furnished by the Suburban Rapid Transit Company. All dimensions, sectional areas, details of connections and general forms, as shown upon these drawings, must be strictly adhered to until changes in the same may be directed in writing by the engineer.

Reasonable changes in the forms of shaped irons showned upon plans may be made by consent of the engineer, to adapt the work to the special forms and plant of the contractor, provided that in making such changes the sectional areas and effective strength of posts will not be reduced in the opinion of the engineer, or extra payments be required from the Suburban Rapid Transit Company. No such changes shall, however, be made, without the written authority of the engineer.

GENERAL DESCRIPTION.

Excepting the wooden floor and cast-iron portion of turning the wedge gear, all parts of the bridge shall be of wrought-iron.

The bridge will be a double track, through structure, consisting of two fixed spans, 101 feet and 10¼ inches between centers of end piers, and one pivot span, 244 and 6 inches, from center to center of end piers.

On each side of the bridge there will be a foot-walk 6 feet wide.

The railroad tracks will be 12 feet apart from center to center.

The trusses of the pivot span and span No. 3 will be parallel to each other at 26 feet apart from center to center.

The trusses of span No. 1 will be spreading, being 26 feet apart from center to center at the north end, and 38 feet and 1 inch apart at the south end.

The floor beams will be suspended from the lower chord pins by plate-hangers; the foot-walk brackets will be riveted to the hangers by the same rivets that secure the floor beams.

The stringers under the railroad tracks will be plate-girders, riveted at the ends to the webs of the floor beams.

The foot-walk stringers will be of wood.

The lower lateral system will be formed of angles and connecting plates.

The top lateral system will be forged rods and struts of angles and plates.

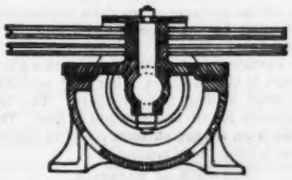
The sway system will consist of substantial portals at the ends of each span, curved brackets at all intermediate vertical posts, and of struts and rods at the central inclined posts of the pivot span.

The brackets, portals, end posts and other points will be ornamented as shown on plans. Under one end of each fixed spans there will be nests of turned friction rollers working between planed surfaces.

The drum of the pivot span will be 26 feet in diameter and be formed of two channels 12 inches deep.

The pivot span will be entirely rim-bearing.

The weight of the span will be transferred to and distributed over the drum by two longitudinal girders in



Cross Section.

line of the trusses, two cross girders under the central posts, and short inclined girders connecting the same.

The drum will be braced by a series of radial struts connected at the center to a movable cast center.

FLOORING.

The wooden floor will consist of transverse ties extending the full width of the bridge. Their scantling will be 8 by 7 inches.

They will be spaced with openings of 4 inches and will be secured to the longitudinal stringers by three-fourth-inch bolts.

There will be a guard rail on each side of each track, 6 by 8-inch scantling. They must be notched 1 inch over every tie and spliced over a tie with a half-and-half joint of 4 inches lap. Each guard timber will be fastened to every third tie and at each splice with a three-fourths-inch bolt.

The guard and floor timbers must be continued over each pier and abutment.

The ties from the center to each end of span must be notched down over the longitudinal stringers so as to reduce the camber in the track, as may be directed by the engineer. All the ties must have a full and even bearing upon the stringers; no open joints or shims will be allowed.

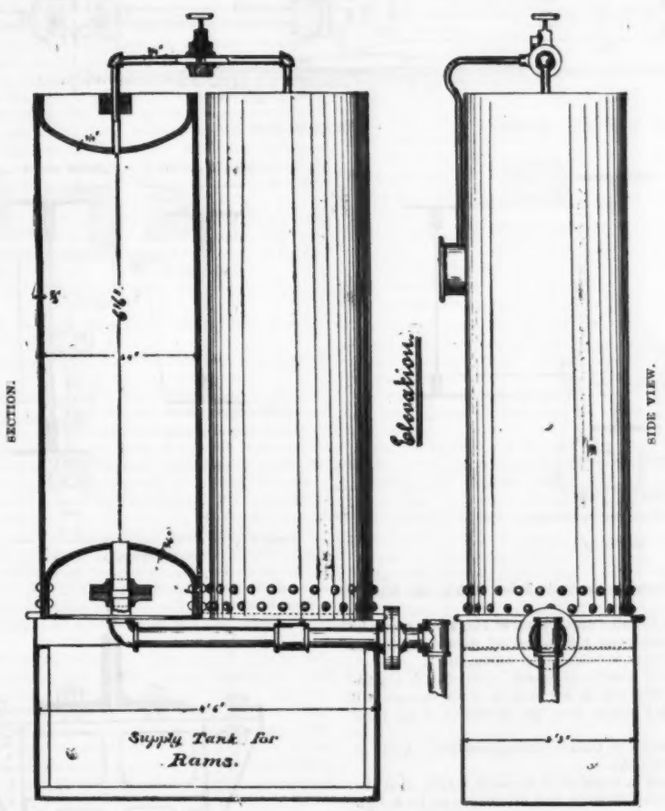
The foot-walks will be supported upon wooden stringers extending over the wrought-iron brackets.

The ends of these timbers will be spliced with a 1¼-inch plank on each side, securely bolted through each stringer with four ¾-inch bolts.

The floor will consist of plank 4 inches wide and 2 inches thick, planed on all surfaces and laid diagonally, with ¼ inch openings, each plank being securely spiked to each stringer.

There will be a substantial and ornamental hand-rail on each side of the bridge, with ornamental lamp-posts and lamps at suitable intervals.

The fascia will be made of galvanized iron No. 24, ornamented as shown on plans; it must be firmly and frequently secured. All joints must be thoroughly and smoothly soldered.



Accumulators. Scale ¼ inch to 1 foot.

OPERATING MACHINERY.

The operating floor will be carried on girders riveted to the central posts of the trusses at an elevation equal to that of the portals.

The operating floor will be covered with two thicknesses of tongued and grooevd flooring ⅜ of an inch thick, with flooring paper between. The engine house will have a wooden frame and will be covered with heavy galvanized iron; the roof to be of best I. X. charcoal tin. Inside, the house will be lined and ceiled with clear spruce narrow ceiling boards. Doors, windows, crestings and finials will be as shown in plans.

The engine house and all the machinery for operating the wedges and turning the bridge will be upon this floor.

The live ring will be composed of fifty-four coned wheels of cast iron, spaced and held truly radial by two guide rings, one inside and one outside of the wheels. Each wheel axle will be connected by tension rods to a moveable centre; the guide rings will also be braced to this center by angle iron struts.

The axes of the wheels will be inclined upwards at an angle so that the upper bearing line of the wheels shall be horizontal. The upper bearing plates will be of wrought-iron and will be planed flat. The plates will be connected to the base of the drum by a series of spring plates.

The lower track circle will be of cast-iron segments bolted together by lugs and firmly anchored to the masonry. Its bearing surface must be planed to the true conical form corresponding to the inclined position of the wheels. The faces of the segments and the bottom surfaces must also be planed so accurately that when the whole ring of segments is assembled upon a truly level surface, the upper surface will be the exact cone desired.

The wheels must be turned smoothly and exactly to proper cone of 16 inches base and 13 feet in height. While each wheel and each segment are under the tool, a distinct reference line, corresponding to a fixed diameter, must be tool marked over their whole circumference.

On the outer end of each axle there will be a cast-iron nut with wings, shaped to the proper form to receive the outer guide ring, with holes for securing the same by countersunk bolts.

This outer guide ring will be of wrought-iron and of trough shape for guiding the operating ropes that turn the draw.

The center casting will be firmly bolted to the masonry by anchor bolts, which are now set in place. The casting must be made to conform to the position of these bolts. The casting will be bored to a driving fit for the steel shaft upon which the moveable center will turn.

Under the end of each truss of the pivot span there will be a toggle for lifting, and a wedge to receive the weight of the ends.

The wedges and their bearings will be of cast-iron.

At each end of this span there will be a wrought-iron pilot secured to the end bearings, and a curved band of wrought-iron secured to the masonry for the pilot to ride upon.

The wedges and toggles will be operated through a system of rods, levers and shafts, by hydraulic rams located on the operating floor at the center of the span.

The pivot span will be turned by means of wire ropes attached to the wrought-iron trough on the wheel axles, and connected to the plungers of the hydraulic rams on the operating floor, through a series of rope sheaves.

MACHINERY ON OPERATING FLOOR.

Two small hydraulic rams with plungers of 7¼ inches diameter and 10 inches stroke. Two large double hydraulic rams with plungers of 7 inches diameter and 6 feet stroke; one double-acting plunger pump, steam cylinders 5½ inches diameter, plungers 2 inches diameter, stroke 7½ inches. One double-acting plunger pump, steam cylinders 4 inches diameter, plunger 1¼ inches diameter, stroke 5 inches, fitted with levers to be worked by hand when desired. Two air accumulators of wrought-iron, 24 inches diameter, and five feet long inside of heads, all seams on sides and upper ends to to be welded, bottom seams double riveted; they must be air tight under a test pressure of 400 pounds per square inch; the accumulators will be fitted with glass gauges, pressure gauges connecting pipe and air release valve. One upright boiler of five nominal horse power, the shells to be made of the best shell iron, the tube sheets of best flange iron, and the fire box of the best flange fire box iron. The boiler must be tested, inspected and certified by the Hartford Steam Boiler Inspection and Insurance Company, for a working pressure of 100 pounds per square inch; the boiler must be fully equipped with steam and water gauges, safety and blow-off valves, grate bars, smoke-pipe, etc. ready for use. One injector for boiler feed. One supply tank for the rams. One feed water tank. One iron coal box.

There will be two balanced hydraulic valves for operating rams, to be moved by levers, one relief valve at accumulator, two check valves on pressure pipe, one steam, one supply and one delivery valve for each pump and the required hydraulic, steam, feed and blow-off pipes. Fire tools and full set of wrenches for all parts of the machinery, must be furnished by the contractor

CHARACTER OF WORKMANSHIP.

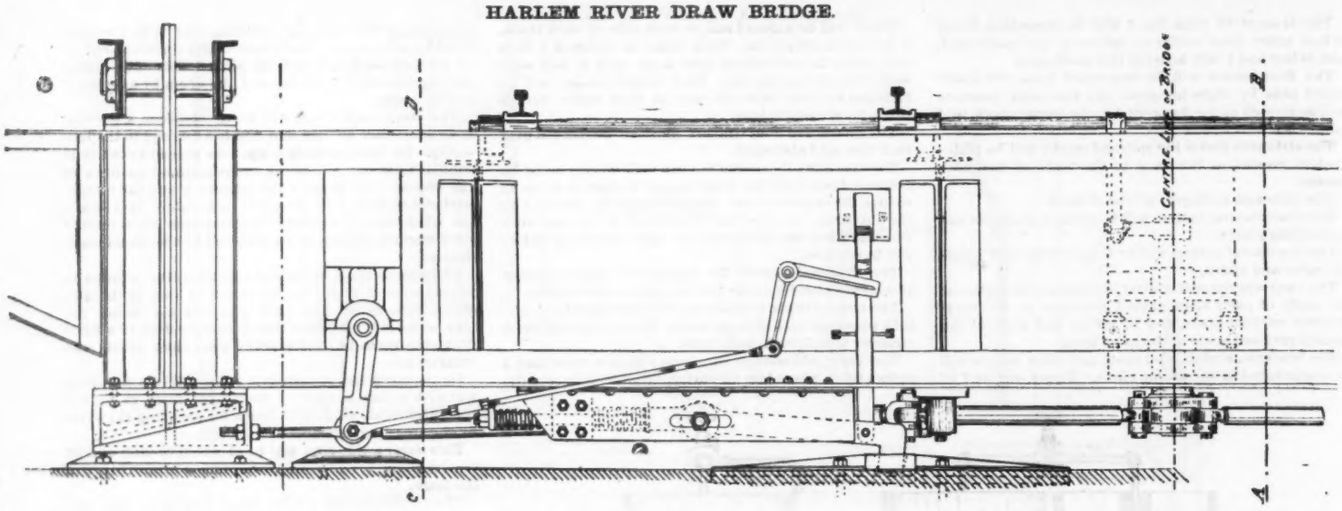
All iron work before leaving the shop shall be thoroughly cleansed from all loose scale and rust, and be given one good coating of pure boiled linseed oil, well worked into all joints and open spaces.

Pins, bored pin holes and turned friction rollers must be coated with white lead and tallow before being shipped from the shop.

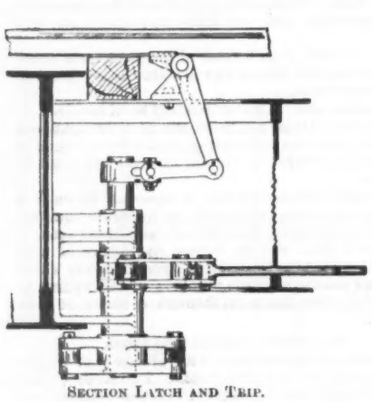
In riveted work the surfaces coming in contact must each be painted before being riveted together. Bottoms bed plates, bearing plates, and any parts which are not accessible for painting after erection must have two coats of paint; the paint shall be a good quality of iron ore paint, subject to the approval of the engineer.

The rivets in all parts of the work will be seven-eighths of an inch in diameter, except where other sizes may be especially mentioned on detail drawings. They must be made of the best double-refined rivet

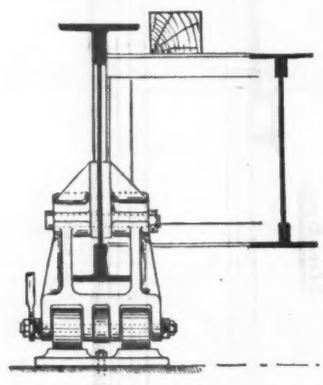
HARLEM RIVER DRAW BRIDGE.



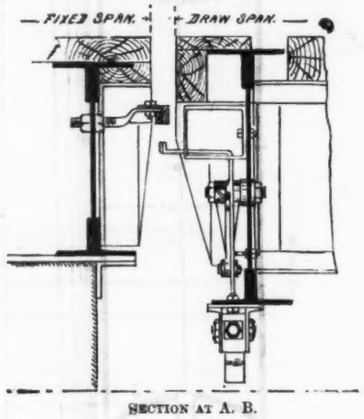
Bearing Block. Lifting Cam. View of End Floor Beam. Spring Buffer Latch.



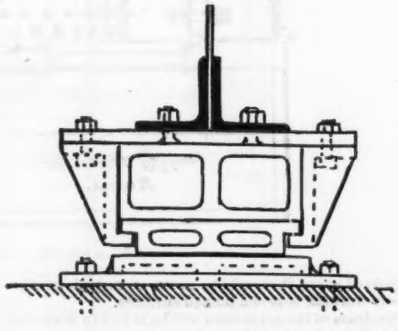
Section Latch and Trip.



Section at C. D.



Section at A. B.



iron, and when driven must completly fill the holes. Their heads must be hemispherical and of uniform size throughout the work. The heads must be full around the edges, neatly made, concentric to the rivet holes, and shall thoroughly pinch the connected pieces together.

Wherever possible all rivets must be machine-driven. All loose or imperfect rivets must be removed and replaced by those of satisfactory character.

All rivet holes must be so accurately spaced and punched, that when the several parts forming one member are assembled together, a rivet one-sixteenth of an inch less in diameter than the hole can be entered hot into any hole without reaming or straining the iron by drifts.

In punching plates or other iron, the diameter of the die must not exceed the diameter of the punch by more than one sixteenth of an inch, and all holes must be clean cuts without torn or ragged edges. The distance from the edge of any piece to the center of a rivet hole must never be less than one and one-half inches, except where specially figured on drawings, or in lattice bars that will not admit of this distance. The several pieces forming one built member must fit closely together, and when riveted must be free from twists, bends or open joints. At all joints and splices in riveted work the abutting ends must be dressed straight and true so there will be no open joints.

The method of manufacturing the heads of the eye bars must be subject to the approval of the Engineer. It must be such that the bar will break in the body instead of in the eye or the neck of the bar. The heads must be formed either from the body of the bars by the process of upsetting and forging, or by upsetting and piling slabs of best scrap; no welding seams on the end or edges of the bars will be allowed.

The bars must be free from flaws and of full thickness in the necks. They must be perfectly straight before boring. The pin holes must be in the center of the heads and on the centre line of the bar. The bars must be bored of the exact lengths given on drawings. The pin holes in any of the members must not exceed the diameter of the pins by any more than one-fiftieth of an inch.

The pins must be turned perfectly straight and smooth, and must fit their pin holes within one fiftieth of an inch.

The several members attaching to the pins must be packed as shown upon plans, and all vacant spaces on the pins filled with wrought-iron filling rings.

All lateral rods must have upset ends of such diameters that the diameter at the bottom of the threads will be one-sixteenth larger than the diameter of the body of the rods.

All threads must be United States standard, except at the ends of the pins.

The pins must be made of such exact length that the nuts will have full threads, and all the pieces be drawn closely together so as to leave no open spaces. The threads must not be cut beyond the inside face of the nuts when in proper place to draw the work well together.

All the square ended top chord sections of the fixed spans and lower chord sections of the draw span must be planed perfectly smooth over all the abutting surfaces, and exactly square to the center line of the sections. The joints in these chords will be 8 inches one side of the center of pins as shown on plans. The pin plates will extend beyond the joint and form the side splice plates. These pin plates must be riveted to the chord sections before boring the pin holes.

The extreme ends of the top chords and the upper ends of the end posts of all the spans and the ends of all built sections of the top chord of the draw span, must be planed free on the bevel line of intersection, with a half pin hole in each. The alternate inside and outside pin plates of these sections will project beyond this bevel line and will have full pin holes. These prolonged pin plates must be riveted to the different members before boring the pin holes.

The lower ends of the end posts and both ends of all intermediate posts will have full pin holes.

All pin holes must be bored exactly perpendicular to a vertical plane passing through the center line of each member, when placed in a position similar to that it is to occupy in the finished structure.

All the members must be free from twists or bends. Portions exposed to view must be neatly finished.

The friction rollers must be smoothly turned and exactly to the same diameter.

All bolts must be of neat lengths and have a washer under the heads and nuts where in contact with wood.

All the workmanship must be first class in every particular.

All the working surfaces of the draw mechanism and machinery must be machine finished and all parts carefully fitted and adjusted.

Abutting surfaces must be in exact contact throughout. All bars in the same set must pull equally even under the dead load of the structure. The trusses must be perfectly plumb and straight in line. The ties must be true from the top surface, ready to receive the rails without adzing or shimming.

CHARACTER OF MATERIAL.

All wrought-iron must be tough, fibrous and uniform in character. It shall have a limit of elasticity of not less than 26,000 pounds per square inch.

Finished bars must be thoroughly welded during the rolling, and be free from injurious seams, blisters, buckles, cinder spots, or imperfect edges.

For all tensions members double-rolled bars shall be used. They shall stand the following tests:

Full-sized pieces of flat, round or square iron, not over 4½ inches in sectional area, shall have an ultimate strength of 50,000 pounds per square inch, and stretch 12½ per cent. in a length of 10 feet.

Bars of a larger sectional area than 4¼ square inches, when tested in the usual way, will be allowed a reduction of 1,000 pounds per square inch for each additional square inch of section, down to a minimum of 46,000 pounds per square inch.

When tested in specimens of uniform sectional area of at least ¾ square inch for a distance of 10 inches, taken from tension members which have been rolled to a section not more than 4¼ square inches, the iron shall show an ultimate strength of 52,000 pounds per square inch, and stretch 18 per cent, in a distance of 8 inches.

Specimens taken from bars of a larger cross-section than 4¼ inches will be allowed a reduction of 500 pounds for each additional square inch of section, down to a minimum of 50,000 pounds.

The same sized specimens taken from angle and other shaped iron shall have an ultimate strength of 50,000 per square inch, and elongate 15 per cent, in 8 inches.

The same sized specimens taken from plates less than 24 inches in width shall have an ultimate strength of 48,000 pounds, and elongate 15 per cent, in 8 inches.

The same sized specimens taken from plates exceeding 24 inches in width shall have an ultimate strength of 46,000 pounds, and elongate ten per cent.

All iron for tension members must bend cold for about ninety degrees, to a curve whose diameter is not over twice the thickness of the piece, without cracking. At least one sample in three must bend one hundred and eighty degrees to this curve without cracking. When nicked on one side, and bent by a blow from a sledge, the fracture must be nearly all fibrous, showing but few crystalline specks.

Specimens from *angle, plate* and *shaped* iron must stand bending cold through ninety degrees, and to a curve whose diameter is not over three times its thickness, without cracking.

When nicked or bent, its fracture must be mostly fibrous.

Rivets and pins shall be made from the best double-refined iron.

The cast-iron must be of the best quality of soft gray iron.

All facilities for the inspection of iron and workmanship must be furnished by the contractor. He must furnish without charge such prepared specimens of the several kinds of iron to be used as may be required to determine their character, and must also furnish the use of a testing machine capable of testing the above specimens at all mills where the iron may be manufactured, free of cost.

Full sized parts of the structure may be tested at the option of the engineer, but if tested to destruction such material shall be paid for at cost, less its scrap value, to the contractor, if it proves satisfactory. If it does not stand the specified tests it will be considered rejected material, and be solely at the cost of the contractor.

The timber must be strictly first-class Southern yellow pine, or white oak bridge timber, sawed true and out of wind, full size, free from wind shakes, large or loose knots, decayed or sap wood, worm holes or other defects impairing its strength or durability. All flooring timber, ties and guard rails will be treated by some approved wood preserving process, to the satisfaction of the engineer. It will be subject to the inspection and acceptance of the engineer.

PAINTING AND FINISHING.

After the structure is erected the iron work must be thoroughly and evenly painted with two additional coats of paint, mixed with pure linseed oil, of such color as may be directed, the tension members being, however, generally of lighter color than the compression members.

The wood-work of the operating house will be painted or oiled, as may be directed.

ERECTION OF STRUCTURES.

The contractor must furnish all staging and false work, and erect and adjust all the iron work and put in place all floor timbers, guards, etc., complete, ready for the rails.

The spans adjoining the shores of the river may be obstructed by false works erected by the contractor, but no obstructions will be allowed in the spans on each side of the pivot pier, except that boats may lie in one of such spans at a time, one span being at all times left open and unobstructed for the traffic on the river Piles may be driven and trestle work erected in the shore spans, and up and down stream from the pivot pier in the direction of the river channel. All obstructions placed in the river must be properly lighted at night.

On the completion of the work on any span, all obstructions in that span, placed in the river by the contractor must be removed by him to a depth of at least 25 feet below mean hightwater datum.

For purposes of construction, the party of the first part will furnish access to the south shore pier, over the land controlled by the party of the first part, east of Second avenue. The access to the north shore pier through or over lands owned by the New York, New Haven & Hartford Railroad Company, must be provided by the contractor at his own expense, and any occupancy by him of wharves, docks, streets, and public or private property will be entirely at his own risk and expense.

The party of the first part will not assume and shall not be held to liability for any accidents to men or materials connected with the furnishing and erection of the bridge, which may occur prior to the final completion of the work and its acceptance by the party of the first part.

Convenient means of access to all parts of the work, both at the points of manufacture and of erection, shall be provided by the contractor for the engineer and his assistants during its entire progress.

The work will be paid for at a fixed price per pound of finished work for all iron work of the bridge proper and a price for each 1,000 feet of board measure of timber, laid; and a fixed price for all the operating machinery and engine house. Final payments will be made upon the finished weights of iron used in the structure, and finished dimensions of timber used in the floor system.

In case the actual weights of iron in any member exceed the estimated weights from sizes shown on drawings by more than five per cent., such excesses will not be allowed in final payments, nor will an excess of more than two and one-half per cent. upon the total estimated weight in the completed spans be allowed. And it is expressly understood and agreed that any such excesses shall be at the contractor's expense.

The estimated weights and quantities of materials are as follows:

950,000 pounds of wrought-iron work. 35,000 pounds of cast-iron, 95,000 feet, (B. M.) of lumber and timber, exclusive of the engine house. 920 linear feet of wrought-iron hand railing. 1 engine house. 1 set of operating machinery complete according to the plans.

It is expressly understood and agreed that these quantities are approximately only, and may be increased or diminished without affecting the obligation of the party of the second part to furnish, and of the party of the first part to pay for only such quantities of the several materials as may be used in the finished structure.

The party of the first part agrees to pay, and the party of the second part agrees to receive, as full compensation for all work done and materials furnished under this agreement, and in accordance with the plans and specifications, the following sums: to wit:

For each pound of wrought iron,—cents. For each pound of cast iron,—cents. For each thousand feet (board measure) of lumber and timber in the finished structure, exclusive of the engine house,—dollars. For each linear foot of handrailing on the sides of the footways, dollars.—For the engine house complete,—dollars.—For the operating machinery complete,—dollars.

It is agreed that after Februray 1st, 1885, partial payments will be made not oftener than once in each month, of eighty per cent. of the value of work done and materials furnished at the bridge site during the the preceding month, as estimated by the engineer, and that on the completion of the work, in accordance with the specifications, the party of the first part will pay in full the sum due for the whole work, as certified by the engineer.

The party of the second part agrees that the party of the first part shall be and hereby is authorized to deduct and retain out of any moneys that may be or become due to the party of the second part under this agreement, the sum of $100 per day as liquidated damages for each and every day that the completion of the whole work, or any portion thereof, which is agreed to be completed by a specified day, shall be delayed bevond such specified day, provided that such delay shall not have resulted from causes beyond th ecntrol of the party of the second part, of which the engineer shall be the judge, and shall not have been caused by a written order of the party of the first part to suspend such work for causes other than defective or negligent construction.

The party of the second part further agrees that he will indemnify and save harmless the party of the first part against all claims and demands of all parties whatsoever for damages or compensation for injuries arising from any obstructions created by them, or from neglect or omission to provide proper lights and signals during the construction of the work.

The party of the second part further agrees that he will present to the party of the first part satisfactory evidence that all just liens, claims and demands of the said part of the second party, or of parties from whom materials used in the construction of the work may have been purchased or procured, are fully satisfied, and that the bridge constructed under this agreement is fully released from all such liens, claims and demands, before the said party of the second part will demand or shall receive the sums due on final payment under this agreement.

Municipal Engineering; Paper No. 2.*

PROVIDENCE, RHODE ISLAND.

(*Concluded from Page* 54, Vol XVI).

Street Cleaning and Sprinkling.

Street Cleaning.—This work is performed by the employés of the Highway department. The work is divided into three divisions, viz.: Paved streets swept by a daily patrol; paved streets swept by horse machines, and unpaved streets. Those swept by a daily patrol, about 117,711 square yards, are located in the center of the business portion of the city; those swept by machines, about 341,214 square yards, are each cleaned about once a week. A gang using two two-horse machines is at work every night when the weather is suitable. The cleaning of the unpaved (macadam or gravelled) streets, about eighty-eight lineal miles, is performed by one gang that averages about nine circuits per year, except in main thoroughfares which are cleaned oftener when required. The streets sweepers used are of the Abbott Downing Co.'s make, of Concord, N. H., with the addition of a third wheel and a pole instead of a shaft together with other improvements, made under the direction of the city engineer. For plan and details see accompanying Plate 34.

The sweepings from the unpaved streets are wasted at the nearest dumping ground where filling is required; those from paved streets are saved and sold as a fertilizer. There are two grades, those taken from the streets swept by the daily patrol are worth double that swept by the machines.

Snow Removal.—By city ordinance the abutting owners on any street where there is a sidewalk supported by a curbstone, are required to remove the snow from the same; the remainder of the street is cleared when necessary by the employés of the Highway department and the street railroad company when the street is occupied with their rails.

Street Sprinkling.—This work is done by private indiuidvals. The parties doing the work are governed by the following rules and regulations of the Board of Public Works:

STREET SPRINKLERS AND STREET SPRINKLING.

No person or persons shall be permitted to take Pawtuxet water from the fire hydrants or street sprinklers to sprinkle any of the streets or portions of the streets of this city, or for any other purpose, without having obtained a permit from the Board of Public Works, or their Secretary, which permit shall be only good for the time named therein.

The sprinkling of the streets shall be done in such manner as not to become injurious to the health of the public, or to cause the streets to become muddy in consequence of said sprinkling.

The orifices of the tube or sprinkler through which the water passes from the sprinkling cart or wagon to the street must not exceed one-sixteenth of an inch in diameter, or sixty orifices to the running foot of tube or sprinkler.

All sprinkling carts shall be subject to inspection by an inspector authorized by the Board.

In taking water for street sprinkling purposes no leakage or waste of water, either from street sprinkler, hose, or sprinkling-cart will be tolerated; and all persons using the sprinklers shall leave them properly covered.

All instructions received from an authorized inspector, relative to the sprinkling of streets, shall be fully complied with.

Violations of rules relating to sprinkling streets shall be deemed sufficient reason for refusing further permits.

The carts are filled from street sprinkler hydrant, the cover or top of the same being flush with the sidewalk as in the fire hydrants.

Garbage Removal, Etc.

The system of garbage removal is supervised by the Superintendent of Health. The large hotels make private contracts with out

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of town parties and remove garbage daily. The house garbage is removed twice a week from November to April and three times a week from April to November, by contract at a cost of $1,000 per month. It is removed in two-horse box wagons with hinged covers and requires on the average ten two-horse teams and two men to each team. The quantity removed is about twenty-four loads per day each load containing 90 cubic feet. The garbage is taken out of town and fed to hogs. There is no regulation in regard to house receptacles; flour barrels are chiefly used. Ashes are kept separate and removed by the occupant at his pleasure. This system of garbage removal works very satisfactorily.

Vault Cleaning.—Figures obtained from the Superintendent of Health show that there were on July 1, 1885, 11,981 privy vaults in the city; these, together with the cesspools (10,136 in number) are cleaned by private enterprise, there being several parties who make it a regular business, the charge being $2 for a load of 44 cubic feet. Quite a number of farmers, living in or near the city, employ one or more carts, collecting for use on their own farms. The removals are principally made in cold weather. The law relative to this work reads as follows:

From the first day of April to the first day of December in each year no person shall remove or transport through any highway or street of the city, the contents of any cesspool or privy vault, or any offensive substances, unless the same shall be removed by means of an air tight apparatus, or in such a manner as shall prevent entirely the escape of any noxious or offensive odor therefrom.

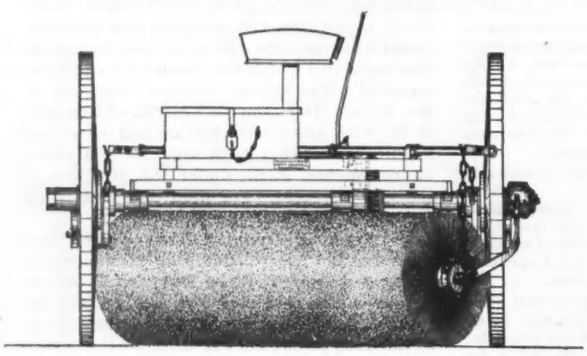
In the warm weather tubs or casks are used, and in cold weather box-carts, holding from 15 to 44 cubic feet. All parties engaged in this business are required to obtain a license from the Health Department.

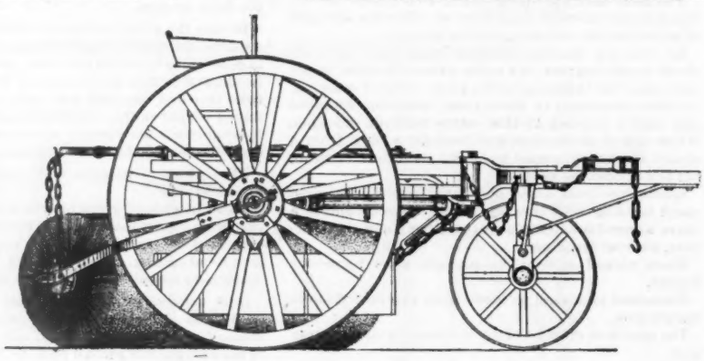
Storm Water Disposal from Houses.—Storm water from roofs is taken into the private drain where there is a sewer in the street. Where no sewer exists and the water is not collected in cisterns, it is often carried across the sidewalk into the gutter in a slight depression on the concrete or by a pipe laid under the surface and through the curbstone.

Street Obstructions.—Anything within the limits of the street, whether underfoot or overhead, which renders, or is liable to render the same unsafe for public travel, is regarded by the law as an obstruction in the street, and is prohibited accordingly.

Street Railways.

The Union Railroad Company have the ownership and control of all the street car railways. The accompanying plan and information was presented by said company.





STREET SWEEPER
used in the
CITY OF PROVIDENCE
Scale - 1 inch per foot

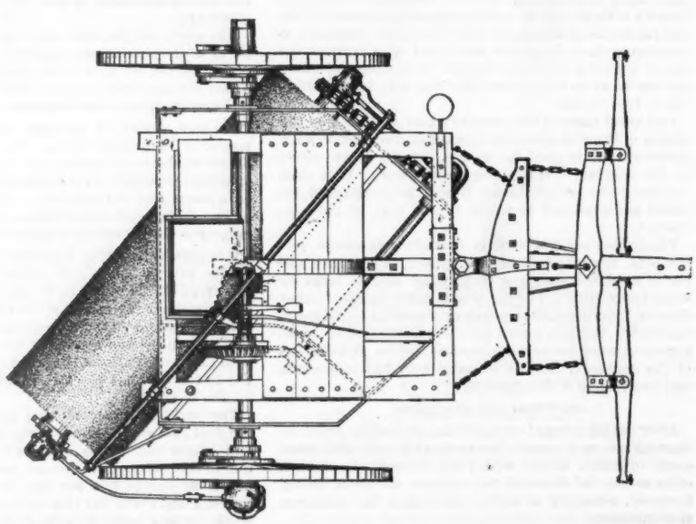


Plate 34.

Accompanying Plates 35, 35*a*, 35*b*, gives details of rail and fastenings, distance between tracks, etc.

The following is the ordinance relative to horse railroads:

SECTION 1. The following rules and regulations are hereby established, for the due regulation of the several horse railroads, used for the conveyance of passengers in the streets of the city, to be observed by the officers, agents and servants of the several corporations or companies owning said railroads.

I. No car shall be drawn at a greater speed than five miles an hour in Westminster, Exchange, Sabin, Aborn, Washington east of Walker, or Weybosset streets, Market square, Canal street south of Friend street, North Main street south of Olney street, Charles street south of Randall street, or South Main street north of Transit street; nor at a greater speed than seven miles an hour in any other street in the city.

II. While the cars are turning the corners from one street to another, the horses shall not be driven faster than a walk.

III. Cars driven in the same direction shall not approach each other within a distance of three hundred feet, except in case of accident, when it may be necessary to connect two cars together, and also except at stations.

IV. Cars running in different directions shall not be allowed to stop abreast of each other, except at stations.

V. No car shall be allowed to stop on a cross-walk, nor in front of an intersecting street, except to avoid collision or to prevent danger to persons in the street.

VI. When the conductor of any car is required to stop at the intersection of two streets, to receive or land passengers, the car shall be stopped so as to leave the rear platform slightly over the further crossing.

VII. The conductors and drivers of each car shall keep a vigilant watch for all teams, carriages, persons, on foot, and especially children, either on the track or moving in the direction of the track; and on the first appearance of danger to such teams, carriages, persons or children, or other obstruction, the car shall be stopped in the shortest time and space possible.

VIII. The conductors shall not allow aged and infirm persons, women or children, to enter or leave the cars while in motion.

IX. Conductors shall announce to the passengers the names of the squares and principal streets, as the car reaches them.

X. No car shall be allowed, between the hours of six o'clock in the forenoon and eight in the afternoon, to stop upon the track of any railroad in either of the streets in the city, except while passengers are actually leaving or entering the same, or while detained by obstructions upon the track, or to avoid collision: *provided*, that this rule shall not be construed to apply to cars standing upon the track at either end of the route.

XI. The several railroad corporations shall place and keep in a conspicuous position in each car run upon their respective roads, a printed copy of these rules and regulations, and of such additional ones the same subject as may, from time to time, be adopted by the city council.

SEC. 2. Whenever there shall occur a fall of snow of sufficient depth to allow vehicles to pass over the same on runners, no snow plough shall be allowed to pass over the track of any railroad corporation or company, laid in any street; nor shall the respective corporations or companies owning such roads cause or allow snow to be removed from their several tracks without the consent of the highway commissioners, acting under the advice and direction of the mayor, being first had and obtained. The consent for the remova

of the snow, for the opening of the tracks, being refused, the several railroad corporations are authorized to use a sufficient number of sleighs or other vehicles to convey passengers requiring a transit over their respective roads, day by day, until the cars can be used on the tracks.

SEC. 3. No railroad company or corporation shall sprinkle salt or any article of a decomposing nature on their tracks or rails, nor cause nor allow the same to be done by their agents, for the purpose of melting

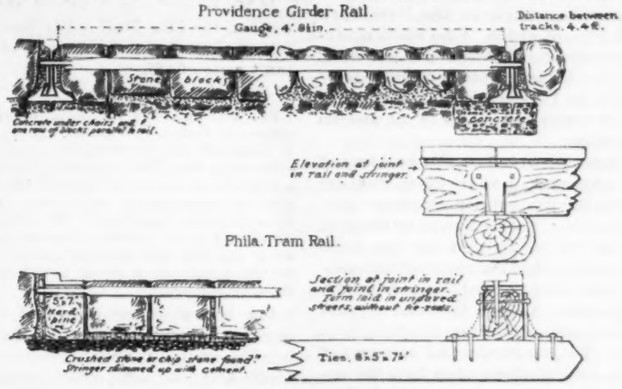

Providence Girder Rail.
Gauge, 4' 8½in.
Distance between tracks, 4.4 ft.
Stone block
Concrete
Elevation at joint in rail and stringer.
Phila. Tram Rail.
Section at joint in rail and joint in stringer. Tram laid in unpaved streets, without re-rails.
Ties, 8'5"x 7½"

Plate 35.—Street Railways.

the snow, nor wash, nor cause to be washed by any of their agents, the said tracks or rails with brine or pickle, for a like purpose, unless a permit is granted therefor by the highway commissioners.

SEC. 4. No car used for the transportation of freight or merchandise shall be suffered to remain upon the main track of any railroad in any street for more than ten minutes, except for the purpose of being laden or unladened, and not more than thirty minutes in any case; nor shall such car be left within sixty feet of any other car upon the same track.

SEC. 5. Whenever any car used for the transportation of freight or merchandise shall be drawn or remain upon the track of any railroad in any street after

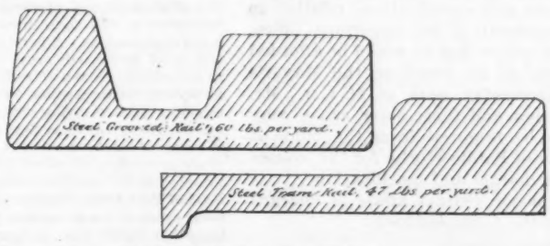


Plate 35a.—Rail Sections Half-size.

sunset, a good and sufficient light shall be hung or placed upon each end of such car, so as to be distinctly seen.

SEC. 6. Whenever horse or other animal power is used to draw freight or merchandise cars upon any railroad track in any street, such horses or other animals shall have, upon each horse or other animal, at least one bell; and whenever such cars so drawn by horses or other animals shall be moving in the same direction upon the same track, they shall not approach each other within a distance of at least 150 feet.

SEC. 7. No owner, driver or other person having charge of any vehicle shall stop, or suffer the same to be stopped, so as to obstruct the passage of a car upon the track of any railroad company laid in any street, except for the purpose of placing upon or taking from such vehicle some article of merchandise of such weight or bulk as to prevent its being done in any other manner; and then only during the time that such article is being actually placed upon or taken from such vehicle.

SEC. 8. No person shall unnecessarily or wilfully obstruct, in any manner whatever, the passage of any freight or passenger car over or upon the track of any railroad corporation or company, in any street.

SEC. 9. Every person, company or corporation who shall violate any of the provisions of this chapter, shall pay for each and every violation a fine of not less than two nor more than twenty dollars.

SEC. 10. The permission before granted to the Union Railroad Company, and to the following companies respectively, which by acts of the general assembly were consolidated with said company, viz.: the Providence and Pawtuxet Railroad Company, the Elmwood Horse Railroad Company, the Broadway and Providence Railroad Company, the South Main Street Horse Railroad Company, and the Providence, Pawtucket and Central Falls Railroad Company to locate and operate, by horse power, with freight cars, railroad tracks within this city in certain streets, as the same are now located and operated therein, is hereby continued to said company.

The permission heretofore granted to the Boston and Providence Railroad Company, the Providence and Worcester Railroad Company, and the Hartford, Providence and Fishkill Railroad Company, respectively, to locate and operate, with steam or horse power, railroads within the city in certain streets, is hereby continued to each of said companies respectively.

SEC. 11. The permission granted and continued to said companies respectively is so granted and continued under the powers and obligations created by their several acts of incorporation, and subject to all the provisions of this chapter, and upon the express terms and conditions hereafter named.

SEC. 12. In locating, continuing and using their tracks respectively, said railroad companies shall severally conform at all times to the surveys, grades and regulations of any and all of the streets occupied by the rails of any of said companies as the same now are or hereafter may be established by law. The gauge of each track shall be 4 feet 8½ inches, and the rails used by said companies respectively shall be of that size and pattern of which an exact pattern has been heretofore approved, or of such pattern as shall be approved by the standing committee on railroads and the highway commissioners. The location of said roads respectively, the several routes thereof, the distance of the rails from the curb-stone, the method of laying and securing the rails and road-bed, the location of the turnouts and the profile of the grade of said roads respectively, shall conform to the surveys and plans thereof respectively as the same are now on file in the city clerk's office.

SEC. 13. Said companies shall severally keep and maintain in good order and condition, by paving, repaving and repairing wherever and whenever necessary, and at their respective proper costs and expense, that portion of the streets that may be occupied by their railroads, so that the said streets may be safe and convenient for travelers with their teams, carts and carriages at all times; and in all streets, the said companies shall respectively pave between their rails and 1½ feet outside of each rail.

SEC. 14. All work at any time done on any street in the city by any railroad company shall be done under the supervision and subject to the approval of the highway commissioners, and every railroad company shall mend, repair, pave and repave the streets occupied by their rails as hereinbefore provided for, and remove all obstructions therefrom whenever required to do so by the chairman of the standing committee on railroads; and should they neglect or refuse so to do for a period of ten days after notice that they are so required, in such case the city council may forbid the running of any car or cars on such streets, or any of them, until such requirement is complied with, and the work may be done by the highway commissioners, and the expense thereof shall be paid by the company so refusing or neglecting.

SEC. 15. In every case where work is required to be done by any railroad company, the city of Providence reserves to itself the right to do the same at its option, and the expense thereof shall be paid by the company of whom such work was required; and if such company shall neglect or refuse to pay such expenses, within ten days after demand therefore, the city council may forbid the running of any car or cars upon any portion of the railroad of such company until the same is paid, and may have a lien upon the railroad of such company within its limits, for the payment of all expenses.

SEC. 16. Every railroad company shall, at all times conform to all such rules and regulations as may, from time to time, be made by the city council, as to the use of the streets through which their track runs, the rate of speed and mode of use of such track.

SEC. 17. Every railroad company shall, at all times, indemnify and save harmless and defend the City of Providence of and from all damages, costs and expenses to which said city may be subjected or made liable, by any proceedings at law or in equity or otherwise, growing out of the grant or continuance of the permission and privileges granted to such company by this chapter, or out of the exercise and enjoyment of the same by such company.

SEC. 18. The city council shall have the right to permit any railroad company to run its cars over the track of any other company within the city limits, upon the

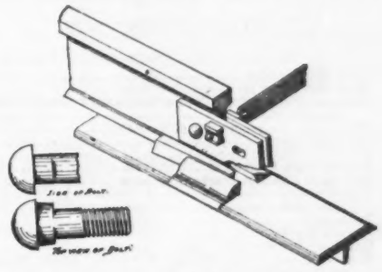


Plate 35b.—Details of Providence Girder Rail.

payment of such compensation and upon such terms and conditions as may be agreed on by such companies, or in default of such agreement, then upon such terms, conditions and compensation as said city council may prescribe.

SEC. 19. Each railroad company shall have the right to give notice to the city council, at any time, that such company will no longer use or enjoy the grant or privileges herein made or continued to such company, as to all or any portions of the streets occupied by their rails, and shall thereupon, within ninety days after such notice, remove their railroad track and fixtures from such streets or portions thereof, and restore the same to their original condition, and in as good order and repair as the same may then be, and to the satisfaction of the city council.

SEC. 20. The city council shall have the right to annul, or amend, or alter in whole or in part this chapter, and the terms and conditions upon which permission is hereby granted or continued to any railroad company, to locate, continue or operate railroads within the city, and also the right to order such railroads and the rails or any part thereof to be taken up, and the street or streets through which the same are laid to be restored to their original grade and condition, and to be put into good and complete order and repair, so that the same may be safe and convenient for travellers with their teams, carts and carriages at all seasons of the year; the same to be done at the expense of such company, under the superintendence and to the satisfaction of the highway commissioners; and in case the same is not done by such company within the time limited therefore, then the city council may cause the same to be done, and the expense thereof shall be paid by such company, and said city shall have a lien upon the road hereby authorized, for the payment thereof. Said city council shall give at least ninety days' notice to any company of its intention to alter, annul or amend the terms and conditions of the permission hereby granted or continued, or of its intention to require the rails to be taken up; and whenever said terms and conditions shall be altered, amended or annulled, or any company shall be required to remove its rails, they shall have, at least, the period of ninety days from the passage of the order making said alteration or requirement, to comply with the same.

SEC. 21. Each railroad company shall in writing accept the permission and privileges hereby granted or continued, and agree to comply with and adopt all the provisions, conditions and restrictions upon which the same are hereby granted or continued, and agree to

Continued on page 76

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AND

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THE Rothchilds have failed in their efforts to place the capital for the Manchester Ship Canal.

THE Government of New South Wales has just placed a loan of £5,000,000 on the London market presumably for extending their railroads and other public improvements. This brings the indebtedness of that "Jingo" colony up to £41,000,000 or, as, they have about 1,000,000 inhabitants to $200, per capita against $24 in this country and about $105 in England.

THE Gruson chilled-cast-iron armor plate, which lately stood successfully 3 shots from the 16-inch (100 ton) gun at Spezzia, has just resisted successfully a fourth shot from the 16-inch gun, although the last shot struck the plate at the point where the latter had been most weakened by the previous shots. This record of resistance to 4 shots from the 16-inch gun, is the best record made by any armor plate up to the present date.

THE Aqueduct Commmission on Wednesday discharged, by a vote of 4 to 3, Mr Jas. W. McCulloh, the very efficient Secretary of the Board, appointing in his place John C. Sheehan, brother of Assembly Sheehan of Buffalo. Since the reorganization of the Commission efforts to "freeze out" Mr. McCulloh have been made by reducing the salary from $6000 to $4000; but Mr. McCulloh did not go and hence the peremptory action of Wednesday. The obnoxious Secretary was too good a man and knew too much for the present ring.

THE contract between the New York Electrical Subway Commission and the Consolidated Telegraph and Electrical Subway Company, which was provisionally awarded a short time ago, was formally signed, sealed, and delivered in triplicate, on Tuesday. The specifications are to be ready by next Tuesday.

A very strong opposition to the New York Arcade R. R. Co., of which Ex-President Arthur has consented to be President, has been organized by the leading owners of Broadway property. Up to Tuesday representatives of property of the assessed value of £40,000,000 were in opposition.

The main objection urged to the building of the road, as proposed, is that great damage will be done to the property on Bradway during its construction. Suit is also to be brought in the Supreme Court to wind up the company as it is claimed that the rights of the company, if any such ever existed, ceased in 1878.

The officers of the Arcade Railroad express no fear of the movements of the opposing property owners. To counteract the opinions of the architects quoted above, they have the opinions of Gen. J. Newton and Gen. G. B. McClellan, declaring that but little, if any, damage will result to the buildings by the excavation. With regard to the constitutionality of their franchise, they say that the same arguments now brought forward were used before the Legislature and the Governor, but the Legislature passed the bill and the Governor signed it, and their lawyers claim that it is constitutional and valid.

THE crucial test of Commissioner of Public Works Squire's ability to "hold on" has commenced. Mayor Grace on Wednesday preferred charges and specifications relative to his mismanagement of his important office, and gave him notice that he would be afforded an opportunity to be heard at the Mayor's office on Wednesday next at 11 A. M. Mr. Squire must then and there show cause why he should not be removed from the office of Commissioner of Public Works for the causes set out in the charges and specifications.

There are seven distinct kinds of charges made against the Commissioner:

First.—Mutilation of records.

Second.—Certifying to false pay rolls.

Third.—Failure to comply with the civil service law and regulations under which twenty-three specifications of evasions of the law in the making of appointments are given.

Fourth.—Neglect of duty and unfitness for office.

Fifth.—Violation of the law and gross and culpable neglect of duty in reference to the Fifth-avenue pavement contract.

Sixth.—The corrupt and illegal bargain with Maurice B. Flynn to resign the office of Public Works Commissioner when called upon to do and to conduct the department as Mr. Flynn should dictate.

Seventh.—Entering into a corrupt and unlawful conspiracy with Mr. Flynn, a contractor having large dealings with the city, by placing the Department of Public Works absolutely in the control of Mr. Flynn.

Charges six and seven are based upon the autograph letter of Mr. Squire to Mr. Flynn. This is the famous letter which everybody talked of soon after Mr. Squire's confirmation as Commissioner of Public Works. It is published in fac-simile in the New York *Times* of the 29th.

Mr. Squire of course makes sweeping denials and claims to be a persecuted man.

Mr. Maurice B. Flynn sends out the following for publication:

To the Editor of the New York Times:

I have been shown this evening by a reporter of a morning paper an electrotype of a letter purporting to be in the handwriting of the Commissioner of Public Works, Rollin M. Squire, wherein he is made to agree that, in the event of his confirmation as such Commissioner, he would place his resignation in my hands and do certain other acts as I might direct. I am informed that the same is to be published extensively in the morning papers in connection with charges preferred by the Mayor against Commissioner Squire.

I desire to deny in the most emphatic manner that any such paper existed to my knowledge at the time of such confirmation, and further to state that I did not secure or obtain or influence the votes of four or of any number of County Democracy Aldermen for his confirmation or agree so to do, either directly or indirectly.

MAURICE B. FLYNN.

If Mr. Squire comes out of this battle victorious, the City Hall politicians may as well take a back seat for the rest of the Bostonian's term of office.

THE first Canadian Pacific train arrived safely, of course, at Vancouver's Island. There was little need to telegraph that, but everything this way tells in the advertising line. The time taken was about six days—a nice trip, of course, in summer, but what will it be with the thermometer below zero? By the way, the train carried 140 passengers. Even supposing all paid, we should like to know the loss on the trip. It looks as if the line was built before the traffic. Under healthy conditions it should have been the reverse.—*Herapath's Journal.*

The editor of our esteemed contemporary ought to know by this time that in America it is the railroads which develop and build up traffic and not traffic which compels railroads to be built. If the "healthy conditions" premised above were waited for by railway builders here, wheat would not be at eighty cents a bushel, and the labor troubles of Europe would be greatly augmented through the more crowded populations which have been thinned out by emigration to the great grain-growing States west of the Mississippi. Here is what the *Railway News* has to say on the same subject:

With regard to the future revenues of the C. P. R. R. Company, estimates and forecasts differ in a very material degree. The extent of the through business can only be matter of conjecture, but new routes have the effect always of promoting traffic, and the tide of immigration still flows towards the vast plains of the northwest regions. A portion of the company's system must necessarily prove for a long time—probably in perpetuity—barren of traffic, but one of the most unpromising portions—that on the north shore of Lake Superior—is now giving renewed evidences of mineral wealth, which may more than compensate in the matter of business for the sterility of the soil. The large yield of silver which made Silver Islet so famous in the past promises to be equalled or surpassed in the neighborhood of Port Arthur, where a government subsidy has been granted for a railway to the new mines. The Canadian Pacific line, at least, represents an extraordinary low capitalization at the present time for the amount of property. In the matter of projected extensions, the bridge across the St. Lawrence will be the occasion of a heavy outlay, and the lines to the Atlantic seaboard can hardly prove remunerative in themselves for some time to come. The directors seem fully aware of the importance of limiting capital outlay if obligations are to be met in the future as they are shown to be in the past year, and assurances are given in the report of special care not to incur any expenditure which cannot be "clearly shown to be to the immediate advantage of the holders of the ordinary shares." Should these praiseworthy intentions be carried out, Canadian Pacific shareholders may be not unfairly congratulated on their position as investors. For some years to come the Government guarantee assures a return of nearly 5 per cent. on the present price of the shares, while their line must share in the development of its special territory and the general prosperity of the Dominion.

Driving Piles by Dynamite.

It is said that Mr. Pradanovic, of Pesth, has been using dynamite for driving piles. He places an iron plate, 15 inches in diameter and 3¾ inches thick, in a perfectly horizontal position on the pile to be driven. A dynamite cartridge in the form of a disc, containing 17½ ounces of dynamite, is placed on the iron plate and exploded by electricity. It is stated that the pile is driven by each explosion to a depth equal to five blows of a pile engine weighing 14¾ Vienna cwt. falling 9 feet 10 inches. The iron plate on the average resists twenty-five explosions.

The gunpowder pile driver depended on the explosion of a charge of gunpowder by the compression of the air in a short gun fastened to the top of the pile; the air being compressed by a heavy piston that fell into the gun, in which it fitted with some closeness, the explosion both driving the pile and throwing the piston up for another fall and explosion. The driver was effective, but coal and a winding engine were cheaper, and it may be doubted if un-confined dynamite will be cheaper than confined gunpowder.

East Indian Railroads.

The report of Col. Staunton, Director General, gives the number of miles open at the end of last March, as 12,376 with 3.767 under construction, 2,891 of which miles were being constructed by the State, 369 miles by guaranteed and private companies, and 506 miles by native States.

The gross earnings were $87,789,370 and the working expenses $43,152,875 or 49.27 per cent. which shows very economical management if their charges approximate to ours, as has been claimed. The profit earnings on all the lines averaged £5.12*s*.9*d*. per cent., or 5.64. being £8.8*d*. per cent. paid on the East Indian and declining to £1.13*s*.11*d*. on the "Assisted Lines."

In the mean time there was a deficit in the Indian revenues including guaranteed interest on railroad securities of £8,368,000 for 1885 and 86. The country has reached the highest possible point of taxation, as out of a yearly income of 30 shillings the ryot is said to pay six in taxes and on account of the heavy remittances to England, each fall of one penny an ounce in silver costs India a million sterling.

Mendacity and Municipal Reform.

The unfortunate connection that has obtained, in this city at least, between efforts to abate misappropriations of public funds or correct administrative abuses, and unfounded assertions, if not downright falsifications, is too well known to those who have, year after year seen attacks on glaring wrongs fail, and fail too, leaving the culprit stronger in his position through the utter inability of the professional reformers making the attack to make a *truthful* statement of the circumstances.

These frequent miscarriages of the force of popular opinion are forcibly brought to mind by some half dozen pages in the last number of the *North American Review*, entitled "Jobs in Cities." The writer, who is at pains to inform us that he is chairman of the Anti-Monopoly League, instead of sticking to his text, starts with "Commodore Vanderbilt injected forty-seven millions of dollars in water into the capital of the New York Central & Hudson River roads. Interest and dividends on that inflation have since been levied on labor and production, in increased freight charges."

Is it possible that there is a man in the United States who does not know that freight charges have been steadily *decreased* since that time, and that the New York Central has made fully as large a decrease as any road?

Some very just remarks on extras in general, lining the upper end of the new aqueduct in particular, (though a curiously ignorant mistake is made in supposing that the *bottom* of the aqueduct is the weak point instead of the top) have their force entirely broken by the remark made by one who "is to confine myself chiefly to such jobs as have come under my own personal cognizance in connection with some participation in municipal reforms." "The Quaker Dam' is one of those 'extras.' This structure, as all experts know, will be entirely useless for the next fifteen or twenty years."

It is seldom that four lines are made to carry so much mendacity. The Quaker Bridge dam was designed and endorsed as an integral and necessary part of the new Croton Aqueduct by such men as E. S. Chesbrough, J. B. Francis, J. W. Adams, G. S. Greene and R. K. Martin, men of unimpeached personal character who look back on long lives of successful practice in their professions, unstained by either misrepresentations or failures. The dam is as urgently necessary to-day as is the new aqueduct, and unless O. B. Potter, his unhappy young man who thought that the masonry of the dam would contract fifteen inches, and the lawyer who testified that de Lesseps had had his dam on the Chagres washed away *three times*, can be considered *experts*, we know of none who have opposed its immediate construction.

The serious Reviews of our country should afford reliable records of facts; this is surely true of one in its seventy-second year; but how will the future historian regard its statements when reading down the page of history, he has been induced to pen a glowing sentence against the proposed job of the "Quaker Dam," and then finds through the succeeding six or eight years vigorous denunciations of the fatuous ignorance and imbecility of commissioners who built the largest aqueduct of the world without providing water for it to carry?

The Discussion on Gordon's Economical Construction of Railways.

When in 1878, Douglas Galton read his paper before the Institution of Civil Engineers entitled "Railway Appliances at the Philadelphia Exhibition of 1875," in which he pointed out some of the items of our superiority in railroad methods over our English brethren, the discussion was of such a character that he concluded it with the remark that "the gist of the observations which had been made seemed to be a sort of bill of indictment against him for bringing before the Institution the railway appliances of America."

Mr. Gordon, an abstract of whose paper will be found in ENGINEERING NEWS for April 17, 1886, wiser in his generation than Captain Galton, says: "No English engineer will admit that in excellence of material or workmanship, or skill in design, the locomotives made in this country are behind any in the world;" and though he immediately adds that unless they are adapted for working easily upon rough and cheap roads, they will be driven out of the field by competitors fulfilling those requirements, he entirely escapes censure in the discussion on his paper.

Nevertheless the discussions, including the remarks of Mr. Fforde, who thought our methods of location "a cut and dried process," and "remembered in one instance *being stopped a fortnight by a hornet's nest*; the men would not go near it and they burned a fire round it until it was destroyed."—afford very interesting reading to engineers who have kept track of the English ulutations since the sale of the Baldwin locomotives to New Zealand, which were, it will be remembered, better, and 20 per cent. cheaper than their English competitors.

The principal points of resistance were on the costs of land and construction, with the relative merits of rolling stock, and pin connected against riveted bridge work.

No land owner in this country, even if he desired it, is of sufficient power to force a satisfactory settlement of *his* land damages as a preliminary to a company's obtaining a charter; but on the other hand *giving* the right of way, on this side of the Mississippi at least, is not a general practice, nor is the direct influence of land grants as great as was thought by those discussing the paper, only 17,544 of the 93,454 miles constructed in 1880 being built from land grants and since that the proportion having been lower.

In relation to the cost of grading, Mr. Shelford opened the discussion by calling attention to the fact that in this country, Canada, and in England, the price per cubic yard is about the same, "1*s*. per cubic yard, notwithstanding that the wages of the navvies in Canada and the United States were $2 (8*s*. 4*d*.) a day, more than double the amount paid in England." This he accounted for by the use of horses and scrapers and the general absence of plant, which he says costs "nothing like £500 per mile, whereas on the Hull & Barnsley line the amount reached £2,000 per mile." Notwithstanding this clear expression of the cause of our being able to do work at about the same price per unit, paying on the average nearly twice as much wages per day, the eminent engineers there present, entirely failed to see either the force or bearing of Mr. Shelford's remarks, and quietly listened to the stock statements of England's supremacy instead of inquiring into the manner in which such great economies were effected.

Mr. Baker opened with the statement that, the point of importance was "*whether the railways of the future were to be made by English or American engineers*," but proceeded to argue from examples given by Gordon and some tenders made to him on the borders of Vermont, against prices for a road in Ireland, that railroads of equal usefulness could be built more cheaply in the latter country than here, adding:

"Highly as he appreciated American skill and enterprise, he was not afraid of American competition, because almost every work in connection with railways depended upon the price of labor. The temperate climate of England must always give an advantage in that respect. Here, the average temperature of July was but 23.5° higher than that of the coldest month. What the range must be in America was sufficiently indicated by the clause in the American bridge specifications providing for 150° variation. The Americans were obliged to put an enormous duty on English rails in order to prevent competition. It has often been said that they had a great advantage in sleepers, but he did not know what American engineers connected with important lines would now contend that they had an advantage over Englishmen, even in regard to sleepers."

Mr. Shelford, however, had shown that the cost of earthwork was about the same in the two countries, and in addition showed how Englishmen who had made the first iron bridges for Canada, "had lost the trade entirely, simply because they had not kept pace with the times."

Of the Hawkesbury bridge Mr. Baker thought it not a "representative international competition for a bridge," believing that very different bids would have been obtained from English builders if Sir John Fowler, or himself, had prepared the designs, and it may also be believed that the bids from American builders would have been different, but whether the Australians would have got so good or so cheap a bridge is another question.

Mr. Matheson, treating the question why, with cheaper iron and steel, England could not build bridges as cheaply as America, put it down to the want of uniformity and

"The higher standard demanded of quality and endurance, as compared with that in America." The pin system "might allow a bridge to be put together in one day; but a bridge that could be put together in so short a time was not to his mind a satisfactory one. When he visited the Louisville bridge * * * in 1885 there were watchmen employed day and night to screw up

loose nuts, and to see that nothing had broken after the passage of a train before letting another train on. The enormous traffic of the elevated railroad had revealed the weakness of the pin system, especially in the case of small pins, and cover-plates had been substituted in the worst cases."

We are at a loss to understand what Mr. Matheson means by "the higher standard demanded of quality and endurance." Mr. Baker, on the preceeding page says: "He could not understand why engineers should use a material like bridge-iron, which would crack in bending to a very moderate angle." This clearly does not describe the bridge iron used by American builders, and the discussion brought out the fact that both our engines and cars are heavier than the English.

The statement about the Louisville bridge is news to us, and if he himself had not said it, we should doubt it. There seems, however, a misapprehension about the elevated roads in this city. The Third and Sixth avenue lines were commenced in 1868, and the lower portions of each were in use by midsummer. On the Sixth avenue line the length of pin-connected trusses is about 3¼ miles, with spans from 35 to 50 feet long, designed for 15-ton engines, the floor system being riveted work.

Exact data are not at hand showing the number of trains that have passed over this portion of the line since its completion, but from January 1, 1880, to December 31, 1885, 1,553,808 trains are recorded, which weighed, on the average, 90 tons each, making 99,842,720 tons, and considering the year and a half preceeding 1880, it is probable that 1,900,000 trains have passed over it. It was soon found necessary to increase the weight of the engines from 15 to 18 and 22 tons. Under these circumstances the tension members of the web system have been increased in area about 50 per cent, not that there was any sign of failure in *any* of the pin-connected work but simply to keep the factor of safety up to the charter requirements.

Over 7,100 pins were taken out and examined, and of these *only one* showed such signs of wear that it was not replaced in the new work.

That one is now in the office of the Chief Engineer, more as a curiosity than because its strength is impaired.

The floor system, of riveted work, required strengthening before the web system, and the girders have been reinforced by plates on their tops and bottoms.

The lower portion of the Third Ave. line was all riveted work of the Warren girder type, single triangulation, and in order to relieve the rivets at the panel points and to keep the factor of safety within the charter limits, its web system has been doubled in strength. The riveted work is, in fact, the only part of the elevated railroad structures that has called for vigilance on the part of the company's engineers and inspectors.

The substitution of cover-plates for pins, of which Mr. Matheson speaks, implies an engineering practice with which we are not conversant in this country.

The daily traffic of the road at present is on Second avenue, 396 trains; Third avenue, 1,128; Sixth avenue, 752; and Ninth avenue 356 trains. The traffic of June 5th last, was, Second avenue, 464; Third avenue, 1,134; Sixth avenue, 876; Ninth avenue, 372 trains, carrying safely and without detention 557,114 passengers.

We trust that the above data, which are given from statements made by Mr. R. I. Sloan, the Chief Engineer of the Elevated Railroad, will put an end to the absurd statements of English engineers as to pin-connected bridges, until they have some road with a traffic approximating to that of the elevated and until they can show bridges as well designed, as cheap and as efficient.

Although a great deal was said in the way of explaining some of the statements made in Mr. Dorsey's paper, Mr. Marcus Smith even thinking "such statements were calculated to mislead the public, and were eagerly repeated by speculators seeking concessions, contracts and subsidies for the construction and operation of railways in foreign countries," the greater portions of the remarks were directed to our rolling stock. Mr. Fforde, he of the hornet's nest, found that "when stopping for refreshments thirty or forty persons would get out, (of American cars) and that occupied four or five minutes." He had also found "an intelligent engine driver" who told him "The American engines are very good and handy, and do their work well; but when they want extensive repairs you can do nothing with them—you must get a new one." Sir Charles Douglas Fox's experience had been that as long as the line was in bad condition no praise was too great for the American engines which were made so flexible as positively to alarm Scotch and English makers. The result was that on a roughly laid road the American locomotive would keep the track while an English one would soon find its way off." But the moment there was a good road to run upon there was no comparison between the two engines in regard to the cost of repairs." Unfortunately for this mechanical paradox, Mr. Dorsey has compared the cost of repairs on the London & North Western and on the feeder branches of the Louisville & Nashville system, as read before the American Society of Civil Engineers at their Denver meeting and printed in ENGINEERING NEWS of July 10th, and where, on the Knoxville branch for instance, the comparison of the cost of repairs and renewals of locomotives per train mile is not as will be observed at all to the credit of the London and North Western.

Mr. Burnett—who spoke "From his experience of the working of America and of English locomotives on the New South Wales Government Railways, of which he had charge for several years as head of the Locomotive Department." remarked that the main difference in the locomotives of the two countries "consisted in the general inferiority in the design, details and materials, as well as the finish, of American locomotives" and mentioned that the new specifications for locomotives, of the New South Wales Government generally excluded American details, as "the boasted superiority of American locomotives either as regards efficiency, durability or, economy in working, was without any foundation in fact."

Nor does he better like our cars; as "the question of dead weight and paying load was in a nutshell; it was simply a question of speed," cars carrying less than twenty or twenty-two tons had more dead weight than four-wheeled trucks weighing four and one-half to five tons and carrying nine to ten tons.

As the traffic reports of New South Wales show that the ratio between paying and dead weight is as 1:3.62; it is probable that freight is there given a velocity totally unknown in this country.

"In New South Wales, notwithstanding every disposition from indirect causes to introduce American rolling stock, very few trucks on the bogie system had been introduced." "That fact alone spoke volumes against the utility for general purposes of the American bogie-truck." "All he need add was that the bogie-trucks sent over to New South Wales from the United States, as examples of the best practice in that country, were vastly inferior in strength to the four-wheeled stock in use in that colony, and were marked for loads which could not be considered safe, except at very low speeds or for use on level lines."

In a late number of *Engineering* he says:

"One may say without hesitation that the bogies of many American locomotives in comparison with English locomotives, are about as poor specimens of workmanship and materials as could well be applied to a locomotive engine, being for the most part combinations of rudely bent bars and paltry bolts and pins such as one might expect from the hands of a country blacksmith of limited resources."

Is this the style of mechanism for which Sir Charles Douglas Fox found no praise too great—so long as the road was rough?

On the other hand, Mr. Smith, who "had known construction trains to attain a speed of more than twenty miles an hour, on a track which, to look at, seemed dangerous for a hand car," thought American engines fitted an uneven track, "as easily as a three-legged stool." And Mr. Shelford who "had traveled comfortably at forty miles per hour over an unballasted road upon a car fitted with bogie-trucks, the road being in such a rough state that it would be alarming and probably very unsafe to travel over in an English carriage," thought it ought to be very seriously considered whether in the case of a new country, the English system was in any way equal to the American.

None of the English engineers mentioned the fact that the rolling friction of American cars and engines is much less than that of the English; a fact that in part accounts for our much greater engine load, as the greater flexibility of our stock accounts both for its less cost for repairs and renewals, and our but slightly greater cost of maintenance of way. It seems evident that rolling stock which can carry passengers comfortably 40 miles per hour over an unballasted road, must be both easier on itself and on the road bed than rolling stock on which the travel would be alarming and probably very unsafe. It was probably this consideration as well as noticing the difference in cost of repairs that induced the managers of the Canadian railroads to give up their English rolling stock and adopt the American type, England having lost its Canadian trade in rolling stock as entirely as it has lost that trade in bridges and for the same causes, viz., the habit of mind that threatened Waddell with expulsion from the Institution of Civil Engineers because he thought he could build a better bridge than a member of the Council and allowed Hawksley to sit down with the sheer weight of years on Deacon in the Vyrnwy dam business; combined with a disposition to rely on the *quantity* of cheap iron used instead of the *quality* of thought devoted to design.

The instance of Canada does not seem to be one in which it can be charged, either openly or covertly, that this change was made "from indirect causes," unless there has been *universal* corruption in that country.

The relation between work done and cost of repairs on a permanent way not more roughly laid than the average English road bed, but of decidedly sharper curvature, is shown by the following table kindly contributed to the discussion of Mr. Dorsey's paper by John Henney, Jr., Superintendent of Motive Power on the New York, New Haven & Hartford Railroad, showing the mileage for the years ending at the dates mentioned, of four engines on that road:

No. of Engine.	End of Year.	Miles Run.	Cost of Repairs During Year.
33	January, 1886.	76,925	$273.18
103	October, 1885.	71,275	206.88
107	February, 1886	68,783	281.83
122	May, 1886.....	89,142	266.37
Average.....		74,781	$257.07

We have not seen any English record that equalled this either in miles run or in low cost of repairs,

Ten years ago this summer the famous "Theatre Train" from this city to San Francisco in 86 hours and 45 minutes, gave a fair test of the endurance of American rolling stock. We reproduce a condensed time-table, and some notes on the performance which appeared in the *Railroad Gazette* during 1876.

Name of Road.	Miles Run.	Time.	Average Speed.
		h. m.	Miles.
Pennsylvania ...	439.5	10.05	43.52
Pittsburg, Fort Wayne & Chicago	468.3	11.45	39.85
Chicago & N. W..	491.0	11.30	42.70
Union Pacific.....	1,032.8	25.19	40.82
Central Pacific...	879.2	23.45	37.02
	3,310.8	82.24	40.18

To the above time 81 minutes consumed in crossing the bridge at Omaha should be added, making the total time 83½ hours as stated.

The distances between Jersey City, opposite New York, and Pittsburg, 439.5 miles *was run without a single stop*, which is believed to stand as the longest run without a stop yet made. The same cars that left Jersey City were run through without change. Most of the Pittsburg and Fort Wayne was a single tracked road with a very heavy traffic and the schedule time was adhered to; west of Chicago the schedule time was exceeded.

West of Omaha there was trouble from hot boxes and the descent of the 90 foot grades which contain nearly all the 5° degree curves on the Union Pacific wore out the brake shoes; otherwise there was no trouble with any of the cars. From Ogden over the Central Pacific the train was hauled the whole distance, 879 miles, by a single engine, that had been out of the shop for eighteen months, had no other prepartion for the trip than repacking the boxes; and returned to its regular work, the day after finishing its long run. This was probably the most arduous engine task of this remarkable trip, as the ascents amounted to 6,300 feet and the descents to 10,600 much of this round, 10 degree curves on 116 feet descending grades; the sum of the curvature on that road being equal to 125 full circles.

Of course it is not expected that in a country of England's small area such feats can be either equaled or approximated; the instances are merely cited to show the utter untrustworthiness of Mr. Burnett's characterization of American rolling stock, and the extreme absurdity of Sir Charles Douglas Fox's wonderful mechanical paradox. For, as above stated, the track of the New Haven road is in quite as good surface as the average English road, and in all England there are not 439 miles of road in as good line and surface as are found on the Pennsylvania road between Jersey City and Pittsburg.

The discussion closes with contributions from Professor Vose and A. M. Wellington, the former calling attention to our careful "locations" and the latter after correcting some minor misapprehensions of Mr. Gordon, tersely summed up the considerations that govern our practice in locating and operating railroads, calling attention to the increasing use of heavy locomotives, the attention of American managers being concentrated on increasing the load hauled, which necessarily involves some sacrifice in fuel economy, properly regarded as unimportant, it being beyond all reasonable doubt that the average train load of freight, if not of passengers, is far heavier in the United States than in England; "and if it were possible to compare locomotive performances per ton of paying freight hauled, the only fair standard of ultimate economy, the American locomotives would unquestionably show a record surpassing that of the English or any other foreign locomotives."

PERSONAL

HARVEY SAWYERS, C. E., has been appointed Chief Engineer of the Chesapeake and Nashville Ry.

C. G. ELLIOTT has accepted the position of Chief Engineer of the Red River Valley Drainage Commission, with headquarters at Crookston, Minn.

P. BALL, of Worcester, Mass., has been appointed engineer to carry out a system of sewerage for Brockton, Mass.

PROF. J. A. L. WADDELL, late of Tokio, Japan, has entered the service of the Phœnix Bridge Company, and his address is now Phœnixville, Pa.

The Aqueduct Commissioners on Tuesday appointed J. INGRAHAM MILLER and CHARLES PUGSLEY as Assistant Engineers to Chief Engineer Church, at $4,800 a year each.

The President has approved the Naval Appropriation bill, the act authorizing a public building at Greensborough, N. C., and the act authorizing the construction of additional lighthouses.

CAPT. M. H. HURDLE, a resident engineer on the Georgia Midland R. R., was killed July 24th near Columbus, Ga., by a rock thrown up by a blast falling on his head.

MESSRS. Aquilas Tremblay, Edgar Lefevre, Julien Charbonneau, Napoleon Fontaine, Auguste Houdet and Phydime Bourque have been granted civil engineer's diplomas, by the Superintendent of Public Instruction of Ontario.

F. T. LEWIS, formerly of Plymouth, Mass., and assistant superintendent of the B. C. & M. R. R., has secured a position on the Boston, Hoosac Tunnel and Western Railroad, as private secretary to the general manager. He is located at Mechanicsville, N. Y.

W. S. BATES, of Chicago, has just completed his patent breakwater along the north half of Lincoln Park in Chicago. The breakwater is about 4,000 feet long and cost three dollars per foot. During the recent severe storms it is estimated that the breakwater saved fully three-fourths of what it cost to the park, no damage whatever being done.

JOHN BAIRD, formerly engineer of the New York elevated railroads, was committed to the Insane Asylum, at Flushing, N. Y., December 1882, and has remained there since that time. Judge Barrett has recently appointed three commissioners, upon the application of Mr. Baird's family, to inquire into his sanity. He is 66 years of age and believes he is heir to the Stewart estate. Physicians say his case is chronic and incurable.

IN response to the advertisement for applications for the position of City Engineer of Toronto, Canada, twenty-one applications were received. The Executive Committee, however, do not recommend any appointment, on the ground that although amongst the applicants there were many engineers of high professional eminence, the majority having had large experience in railway engineering, none of them seemed possessed of sufficient experience in the construction of the extensive municipal works required and contemplated for a large and growing city like Toronto; and they therefore conclude that none of the applicants come up to the required standard. The names of the applicants have not been made public.

HUBERT OGDEN THOMPSON, the well known political "boss" of the New York County Democracy, and Commissioner of Public Works from Dec. 10, 1880, to Dec. 31, 1884, died at the Hoffman House in this city on Monday, the 26th, of apoplexy. He was born on board ship in Boston Harbor, Dec. 14, 1848; the first five years of his life were spent in Rome, Italy, with his artist father; but from the age of eight years he lived in this city. Through a personal friendship with a son of Allen Campbell, the well known Commissioner of Public Works, he became a protegé of the Commissioner and through him got access to the political field which he so successfully controlled thereafter.

THE death is announced of MR. WM. LOW, aged 72. He was born at Rothesay, Bute, in 1814, and in early life was engaged as assistant engineer on the construction of a portion of the Great Western Railway main line. Subsequently he became proprietor of collieries in North Wales, and devoted many years to mining enterprise. His energy and perseverance were displayed especially in the prosecution of the Channel Tunnel enterprise. In 1856, he issued a printed circular describing his plans, and in 1867 had an interview with the late Emperor Napoleon on the subject. Subsequently by the advice of the Committee of which Lord Richard Grosvenor was then chairman, other engineers were invited to join with Mr. Low in this work, and the names of Messrs. Hawkshaw, Brunlees, and Low were associated together as joint engineers of the undertaking. Mr. Low went so far as to purchase land on his own account both at Dover and Calais, so anxious was he to push forward the enterprise. The Franco-German war put a stop to the proceedings for a considerable time, but the project was ultimately taken up by Sir E. Watkin, who invited Mr. Low to become one of the engineers. Among other schemes he took up was a proposed England and India Railway, 2,000 miles of which were personally surveyed in the year 1870.

Liquid Fuel.

How to utilize the advantages of liquid fuel is a problem which has vexed the brain and tested the inventive talents of ingenious men for many years. The methods which have been proposed are legion, and some of them have scored a partial success. The great convenience, economy and effectiveness of fuel reduced to the liquid state need no recommendatory arguments. The market is waiting for the successful invention, and fortune is holding out its open hands for its lucky owner.

Mr. Robert Walker, F. R. G. S., a well known English civil engineer, with offices at 13 Buckingham street, Adelphi, London, has, among other investigators in this field, devoted years of study and experiments to the solution of the desired problem. The results of these patient labors are the Hydro-Carbon Furnace and Apparatus, which consist of a fire-clay chamber or retort made in sections fitted together within the furnace. The liquid fuel is forced into the retort by air or steam or both and is delivered in the form of a gaseous fuel, and impinges on a block of fire-clay set at angles to receive the flame, the result of which is an enormous and economic heat power which can be increased or reduced as required. By this method, not only is the oxygen contained in the air or water consumed, but the hydrogen is also completely burned up. The apparatus for starting and regulating this important system is both simple and effective, and the hydro-carbon furnace and apparatus can be added to existing furnaces and boilers at small cost without any alterations of the engines or furnaces.

The furnace is very favorably commented upon by *Engineering*, and the system is worthy the most careful investigation by interested parties to whom its advantages need not be described.

The inventor, Mr. Robert Walker, is now in this country; he has been traveling extensively in the western States, but will soon return to New York, where he may be addressed at 44 Broadway, Room 25.

Couplers for Freight Cars.

The New York Railroad Commission, July 7th, announced its decision in regard to the car-coupling tests made at East Albany last month. They award the first place to the Hoag coupler. This is an invention not in use on any railroad at present. It is the work of C. M. Hoag, of Greenbush, an engineer on the Boston and Albany Railroad. At the trial it was the only one that made the "flying switch" automatically. In its normal condition the link is level, and works successfully on all cars. The recommendations of the commission, which are the most important made since its organization, are as follows.

First.—That the standard height of draw bar of the Master Car Builders' Association, viz., 2 feet 9 inches from top of rail to center of drawhead, when the car is empty, be adopted by all railroad corporations; that new cars be made to conform thereto, and that old cars, when repaired, be made to conform as nearly as possible.

Second.—That all freight cars not having platforms

be equipped with "deadwood" blocks to conform to the standard of the Master Car Builders' Association.

Third.—That a standard link be adopted of 10½ inches inside measurement and 13 inches outside measurement.

Fourth.—That all existing links and pin drawheads be provided with a stop in the throat to prevent a link entering more than 7 inches.

Fifth.—Of the couplers presented to be tested on the 16th and 17th of June, the board finds the following to fulfill the requirement of the law. There are many others of which the board has drawings or models, and which possess merit, but as to them the board makes no mention for the reasons, first, that cars were not equipped with them; and, second, that little weight can be given to the workings of a model alone. Those practically tested are divided, first, into classes mentioned in what the board regards as the order of merit; second, each coupler is mentioned under its class, in what the board regards as its order of merit.

First Class, A.—Link and pin couplers, pin held up by catch or "dog." The "dog" is thrown back by a link entering and allowing the pin to drop automatically with the old drawbar of stop in throat, or B, beveled pin permitting link to slip under. Hoag, McKeen, N. Barr, Perry, United States, Robinson, Keeler Sherman, Thurber, Whitman, Kilmer beveled pin Wilson beveled pin.

Second Class.—Vertical hook and link, link pushed on to hook, couples automatically with old drawbar of stop in throat. Archer, Aikman, Marks, Smith, Baldwin, Fennell.

Third Class.—Janney, Barnes, Cowell, Thurmond, Dowling, Heim, Titus & Bossinger, Boston automatic, Lorraine.

Fourth Class.—Ames, Custis & Wood, Adams, Felthausen, and Lawtenslager.

Harlem River Draw Bridge, Suburban Rapid Transit Company.

We complete this week the illustrations of the fine draw bridge over the Harlem river at Second avenue connecting the system of elevated railroads of this city with the Suburban Rapid Transit Company's new road recently opened.

The Suburban Rapid Transit R. R. commences on the south side of the Harlem river at 128th street where close connection is made with the Second avenue division of the Manhattan Elevated R. R. The river is crossed by the handsome drawbridge which we have so fully illustrated and of which we print the specifications this week. It has an elevation of 32 feet above the river at mean high water and the road thence passes over the Harlem River and Portchester R. R.

The bridge is one of the handsomest, if, indeed, not the handsomest, in the vicinity of New York City; the Chief Engineer of the Suburban Rapid Transit R. R., from its first inception, is Mr. J. J. R. Croes, well-known to readers of this journal, and under his direction this bridge has been designed by Mr. Theodore Cooper, well and favorably known as a leading expert in iron and steel structures. There are novelties in the design of this handsome bridge which will merit the careful study of bridge engineers.

At the public letting of the work, the contract was awarded to the New Jersey Steel & Iron Company, Trenton N. J., (Cooper, Hewitt & Co., 17 Burling Slip, N. Y.) out of ten bids by the most prominent bridge builders of the country, and the contract has been completed to the entire satisfaction of all concerned.

The New Jersey Steel and Iron Company has probably built at its shops more railroad drawbridges since taking the field in bridge work, than any other concern in the country. They are the builders of the Brooklyn Elevated Railroad and much of the New York roads. This same company has for some time been making and selling solid rolled I beams twenty inches deep. These are the deepest and heaviest sections yet rolled in this country.

Municipal Engineering.

(Concluded from page 71.)

comply with and adopt all the provisions, conditions and restrictions upon which the same are hereby granted or continued, within one month after the passage of this chapter, and shall within that time file the same with the city clerk; otherwise the permission and privileges hereby granted or continued shall be, as to every such company refusing or neglecting so to do, wholly unoperative and void.

OFFICE OF THE UNION RAILROAD COMPANY,
PROVIDENCE, R. I., January, 1886.

Statement of miles of track operated by this company:

City or Town.	Main.	Double.	Turnouts and Connections.	Total in Streets.	Car Houses.	Total.
Providence...	31.916	4.372	4.586	40.874	.851	41.725
Pawtucket....	2.400	.040	.260	2.709	.144	2.853
Lincoln.....	.133	—	—	.133	—	.133
Johnson.....	1.131	.113	.109	1.353	.306	1.659
Ceanston....	3.736	.620	.288	4.644	.263	4.907
E. Providence	.969	—	—	.969	.039	1.008
	40.285	5.151	5.243	50.682	1.603	522.85

D. F. LONGSTREET, V. Prest.

City Bridges.—Who Controls and Repairs.—All of the public bridges, excluding the railroad bridges which are maintained by the railroad companies, are under the general control of the Board of Aldermen, by whom all bills must be approved before payment.

A sub-committee of the Board of Aldermen, called the Advising Committee on Bridges, is appointed who have the more immediate direction of affairs relating to bridges.

The city engineer is the executive officer in charge of bridges and acts under the following ordinance.

"Said engineer shall, under the direction of the Advising Committee on Bridges, have the charge and control of all public bridges, and shall annually and oftener if in his opinion it shall be necessary, or if required so to do by the Advising Committee on Bridges, make a careful examination of all such bridges, and shall make to said committee such reports respecting the condition thereof as to safety and need of repair or renewal, as in his judgement may be required. Said engineer shall make a written report to the city council in the month of January in each year, stating the condition of all the bridges in the city or for which the city is in any way responsible, and shall also with such report present an estimate of the probable cost of repairs upon each of the same for the ensuing year."

The Board of Aldermen are prohibited by ordinance from "building any new bridges or expending in any one year on any bridge except a draw bridge, more than five hundred dollars, or on any draw bridge more than seven hundred and fifty dollars, unless empowered so to do by the city council."

The city owns a general assortment of tools, and employs a foreman who generally makes such repairs as may be needed, except when pile driving or other special work is required.

The total number of bridges is thirty-eight of which eight are of iron, three of stone or brick and twenty-seven of wood.

Black Sea Ports to be Improved.

From the London Times.

The Russian authorities are about to expend considerable sums of money on the improvement of the Black Sea ports. The port of Mariopol is to be thoroughly repaired under the direction of Messrs. Boreicha and Maximovitch, engineers, at a cost of 5,000,000 rubles. At Odessa the mole is to be leveled and repaved. The foundation of the mole is to be repaired and new breakwaters constructed. The harbor is also to be deepened. These alterations will entail an outlay of 1,500,000 rubles. A new port is to be made at Novorossuak for 3,800,000 rubles, and is to be ready by 1888 Various other improvements are to effected at Nicolaieff, Otchakoff, Yalta, Sebastopol, Taganrog, and in the canal of Kertch-Yenikale.

The Dry-Washer.

There are several places in Colorado and New Mexico where it is known that gold exists in large quantities, but where it is impossible to save it, because there is no water with which to wash it. Attempt after attempt has been made to invent "dry-washers" which would separate the gold from the sand and gravel without water. But it seemed almost like an attempt to square the circle or to invent perpetual motion.

One of the favorite places for experiments with machines of this kind has been the vicinity of Golden, or the new placers in New Mexico. It is situated in Santa Fe County northeast of the City of Albuquerque; but there, as elsewhere, the experiments failed until this year. It is now claimed that a machine has been made by the miners at work on these placers, which is a success. They adopted the principle of a machine that was invented by a St. Louis man named Porter. Porter's dry-washer failed, but the principle upon which it operated was, it is said, a good one, and by remedying some of its defects the New Mexico miners have obtained the long wished for machine. This, at least, is what they claim for it.

The Santa Fe *New Mexican* gives Colonel R. W. Webbe as authority for the following description of it: "It is simply a blast machine. The gravel and sand is emptied into a hopper through a screen and it is then carried over a close-woven cloth — ordinary —domestic, attached to which are riffles. This cloth apron is kept in a constant state of agitation, which necessarily keeps the sand and gravel active from a blast produced by a blower in the lower part of the machine. The blast also dries the sand and gravel that may be damp, and the gold is caught on the riffles attached to the cloth.

The capacity of a machine, which one man can turn with ease by a simple crank motion, is from twenty-five to thirty-five cubic yards in ten hours. The dryer the sand and gravel the better, though placer dirt as it is taken from the ground can be treated readily. After the most thorough tests, extending over a period of nearly a year, the machine has fully demonstrated the fact that it will save the finest of gold, and, of course, the nuggets also."

If, indeed, a machine has been invented by which gold, in paying quantities, can be separated from the sand and gravel without the aid of any more water—a gallon per day—than is claimed to be necessary for the New Mexico machine, the invention will revolutionize gold mining in New Mexico. There are thousands of acres of placer ground in that Territory which, without such a machine, are worthless, but which with it would in the aggregate be worth millions of dollars.—*Denver Tribune.*

Remarks to Accompany the Design for a Bridge over the Harlem River.

BY VAUX & RADFORD, CIVIL ENGINEERS AND ARCHITECTS.

The object to be accomplished by the construction of this bridge, is to carry a road from Tenth avenue, New York City, to Aqueduct avenue. Fordham, at a high level over the Harlem valley.

The space between these points comprises sloping bank, the Harlem river, railway tracks and several public streets or avenues.

The Harlem valley at this point, as is well known, is very picturesque, and demands, and deserves, artistic treatment in any structure that may be erected across it.

As will be noticed, the river is not in the center of the valley, and, therefore, interferes somewhat with a symmetrical and balanced design.

The High Bridge or Croton Aqueduct, crosses the valley at a few hundred yards to the south of the site of the intended bridge, on a series of handsome arches, which are

generally allowed to be in harmony with the features of the locality and the surroundings.

The spans of the High Bridge, where it crosses the river are 80 feet in width, and the same dimension has been practically adopted in the five bridges since erected over the same river. Although, therefore, the width of the Harlem river is fixed at 400 feet, there is no engineering necessity on the score of navigation to provide spans of more than 80 feet.

The western slope of the valley, from Tenth avenue to the river is intended for a public park, and should, therefore, be interfered with as little as possible by piers or similar structures.

On the eastern side of the river there are the tracks of the N. Y. C. & H. R. R. R. and the N. Y. & Northern, and immediately adjoining the railway land to the east, is a public street, known as Commerce avenue.

There is no room for a pier on the railway land, and therefore the railways and avenue, must be crossed by one span; which thus becomes the controlling dimension of the structure.

From the eastern side of Commerce avenue to Aqueduct avenue, there is only a sloping bank and two public streets to deal with, and therefore that portion of the structure may be considered as merely an approach, and treated in a subordinate manner.

By the introduction of the architectural features of the two arch pierced piers, and dividing the river crossing proper into two spans, a fairly proportioned arrangement of arches is secured. The two central arches being 196 feet, and the two side ones 175 feet in span.

The arched openings in the piers, provide for the passage of the public river roads, which will have to be constructed when the river improvements are executed, and the western side span leave the park practically untouched.

Allowing, for the sake of argument, that the river crossing was at this time uncontrolled by existing bridges, and that it was needed to provide the maximum of waterway, it will be found on inspection that our two openings give more practicable waterway, than the single enormous span of the Commissioners' bridge.

The spans of our proposed bridge, or more correctly speaking, viaduct, are thus kept within reasonable and easily handled dimensions and weights, and the load on the foundations is an ordinary one, in fact not greater than that on the foundations of High Bridge.

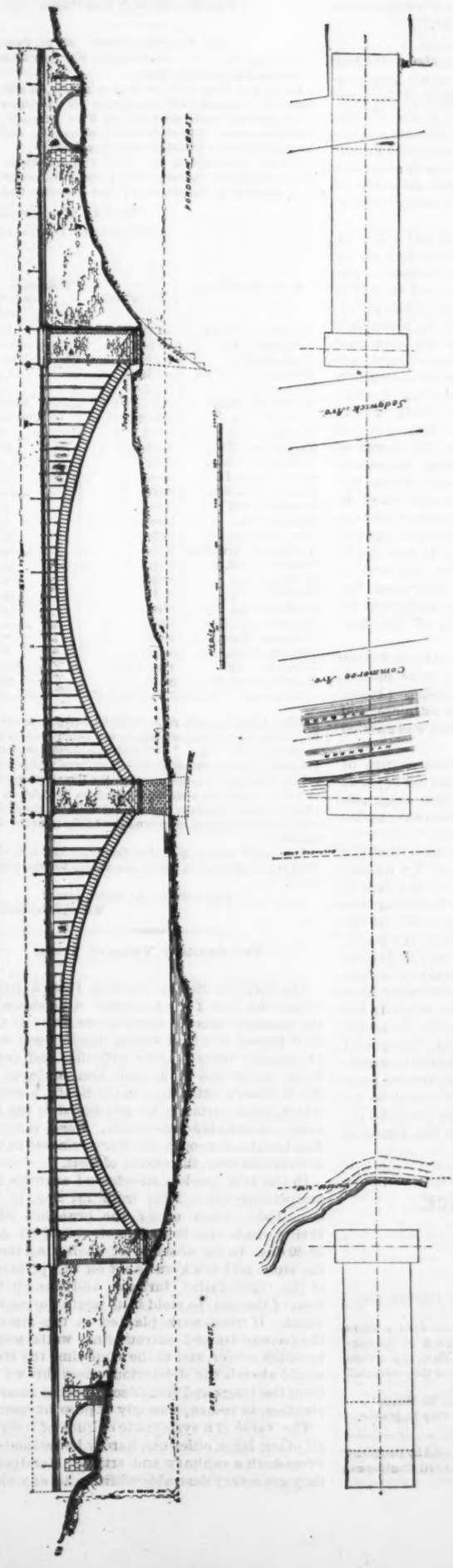
As a necessary consequence of these moderate dimensions, we can accomplish the problem in much less time than will be required to construct the commissioners' bridge, and at a saving of nearly $500,000, although our bridge is designed to be built of the same material viz: Steel, iron and stone masonry, and to be as strong in all its parts, proportionally to the work they have to do, as the commissioners' bridge.

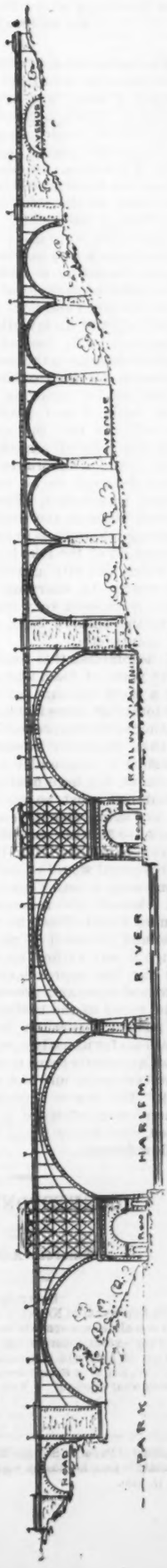
We have positive bids (which were forwarded to the Commissioners at the time we submitted our plan) from Messrs. Post & McCord and Mr. Richard Deeves, iron and masonry contractors of well-known standing and reputation, to construct our bridge for $1,582,000 as against the lowest bids of $2,055,000 for the Commissioners' bridge.

We submit that this difference of $500,000, is one worth saving to the citizens of New York, and we think that in making such a saving, the city will not lose anything in artistic design and appropriateness to the site and its surroundings by erecting the bridge designed by us, in place of the one adopted by the commissioners.

V. AND R.

HARLEM RIVER BRIDGE.—Adopted Plan.





VAUX AND RADFORD'S PROPOSED PLAN.

The Removing of the Shallow Flowage from the Sudbury River.

The bad position in which the City of Boston was placed in 1872 from lack of an adequate supply of water, was briefly alluded to, after which a short account was given of the methods of constructing the basins on the Sudbury river supply, which consisted in cutting off the trees, damming up the streams and filling the basins, with but little attention to the loam on the sides of the valleys or the condition of the bottom.

The basins were filled in 1878 and 1879. In a few years a very bad taste developed in the water, rendering it unfit for domestic use. The different growths of algae and spongilla were described and some of their habits given. Then followed an investigation by a sanitary committee, who decided that the loam and shallow flowage in the basins were largely accountable for the trouble. An appropriation of $125,000 for removing the shallow flowage from basin 3 and $80,000 for basin 2 was secured. In 1883 the speaker was charged with the duty of remodelling the shores of basin 2, and a favorable working season enabled the work to be completed before the ground was frozen. The plan consisted in brief in filling up the shallow portions and excavating others so as to leave nowhere around the margin of the lake less than 10 feet depth of water, and with gravel slopes exposed to the water. In carrying out this plan the shore lines were very much straightened by filling the shallow bays, cutting off the shallow points, etc.

To accomplish this result more than 130,000 cubic yards of loam and gravel were moved, and a large amount of rip-rapping placed. The total cost came inside of the estimate, and a rather more comprehensive plan was carried out than originally intended.

Basin 3 is now under the same course of treatment, but here nearly 300,000 cubic yards of material must be moved. Ten contracts are now being executed, and the price varies from 22 to 31 cents per cubic yard.

The speaker expressed the opinion that the improvement would probably pay for its cost in ensuring a better condition of the supply and showed his reasons for believing the changes would effect the temperature of the water and the wash on the sides of the basin, though it was rather soon to say definitely how far the improvement would stop the growth of algae and prevent the fermentation of the water in the basins. The work is being pushed vigorously and under favorable conditions for its early completion. The gravel slopes are mostly three to one, and the embankments are built one foot above extreme high mark. The water stumps were found to be in many cases offensive, and they are to be removed, even where found below the limits of shallow flowage.

CORRESPONDENCE.

Concrete Arches.

ROCKFORD, ILL., July 13th, 1886.

EDITOR ENGINEERING NEWS:

Will you allow me space to inquire of your readers as to what extent concrete has been used in the construction of arches in this country. Have any arches of any size, say 50 or 60 feet, been built of this material, and with what success? Very truly,

DANIEL W. MEAD,
City Engineer.

*Abstract of Paper on Storage Basins, read by Desmond Fitzgerald before the Boston Society of Civil Engineers, June 21, 1886.

Log and Skiff Navigation.

U. S. ENGINEER OFFICE, 378 St. Paul St.
BALTIMORE, MD. July 27, 1886.

EDITOR ENGINEERING NEWS:

In the New York *Times* of July 23, 1886, in an editorial entitled "Log and Skiff Navigation" is the following: "Concerning the Greenbrier, in West Virginia, Col. Craighill, said: The river is not navigable, and the portion below its mouth is also unnavigable."

I wish very much in the interest of frankness and fair dealings to Congress, leaving me out of consideration altogether, the author of that editorial had also notified his numerous readers that I had also made the following concluding remark in my report concerning the Greenbrier, viz.: "Under all the circumstances of the case, I do not consider the advantages which would result from an improvement of the Greenbrier sufficient to justify the cost, and, therefore I report, in the phraseology of the law, that, in my opinion, the Greenbrier is not worthy of improvement by the general Government."

It is worth noting also that Congress has not, since that report was made, given any money for the Greenbrier.

Respectfully and truly yours,
WM. P. CRAIGHILL.

The Sanitary Value of Trees.

Dr. Stephen Smith recently read a paper before the New York Academy of Sciences on the sanitary value of trees in the city. It is a well known fact that during the intense heat of summer there is more suffering and death from sunstroke and high temperatures in the Northern cities than in the South, a result which must certainly be attributed to the absence of suitable protection. From three to five thousand people die every summer in the metropolis from the effects of heat.

In the arid, treeless streets and avenues the temperature often runs from 130 deg. to 150 deg. Fah., when under the branches of a thrifty shade tree it would not exceed 70 deg. or 80 deg. In the absence of sheltering trees, the stone and brick walls act on the principle of the regenerative furnace, and absorb the heat of the sun, to yield it up again during the night. If trees were planted in the streets, the pavements and surrounding walls would be much cooler, and at the same time the trees would absorb the deleterious gases thrown off from the lungs and from decomposing matter, yielding, in return, a supply of pure oxygen.

The value of a systematic culture of trees in all of our large cities can hardly be estimated. From both a sanitary and artistic standpoint they are a very desirable addition to any city.

WATER

LINCOLN, NEB., SEWERAGE.—Mr. Rosewater, City Engineer of Omaha, at a recent council meeting advised a change from 6-inch to 8-inch pipe, manholes at each block, and pronounced handholes a nuisance. He also advised a modification of the Waring specifications, and at a later meeting Mr. Rosewater's plans, specifications and contract were adopted as substitute for the Waring specifications. A sewer district comprising about one and one-fourth square miles in the heart of the city was adopted, it includes from 130 to 150 blocks. The question of engineering was referred to the sewer committee.

No. 22. Water Pressure in Mains of Various Cities.

COMPILED BY J. J. R. CROES. FROM SPECIAL RETURNS, MAY, 1886.

TOWN AND STATE.	Topography.	Difference of level in town. feet.	In Business District. Day Pressure. lbs.	In Business District. Night Pressure. lbs.	Fire Pressure. lbs.
Lanesboro, Minn.	level.	10	60	60	60
Lewistown, Pa.	sloping.	——	32½	——	——
Meadville, Pa.	rolling.	127	115	115	115
Mechanicsburg, Pa.	rolling.	6 to 8	28	——	——
Modesto, Cal.	level.	0	30	——	——
Northboro, Mass.	hilly.	50 to 60	87	87	——
Pottsville, Pa.	very hilly.	100 to 200	60	——	——
Sewickley, Pa.	level.	0	45	——	——
Springfield, Mo.	rolling.	50	45	45	100
Springfield, Ohio.	hilly.	——	80	80	80
State Center, Ia.	level.	0	20	20	20
Stockbridge, Mass.	hilly.	——	30	30	30
Stratford, Ont.	level.	0	55	55	80 to 100
Sunbury, Pa.	level.	0	56	56	56
Susquehanna, Pa.	hilly.	60	40	40	40
Tombstone, Ariz. Ter.	hilly.	——	160	160	160
West Point, N. Y.	hilly.	150	30	30	60
Wichita, Kan.	level.	8	40	40	80 to 100
Windsor, Ont.	hilly.	56	76	90	76 to 90
Winfield, Kan.	level.	25	52	52	150
Winnemucca, Nev.	level.	——	60	——	——
Whitman, Mass.	level.	0	60 to 65	60 to 65	——
Winona, Minn.	level.	0	——	50 to 60	90
Winsted, Conn.	very hilly.	230	50 to 83	——	——
Woodstock, N. B.	hilly.	65	60 to 65	60 to 65	75 to 110

FATALLY DEFECTIVE DRAINAGE.—It is universally believed that the drainage arrangements at the Colonial Exhibition are wretchedly inadequate, and sore throats and other typhoid symptoms are, and have been, rife among the unlucky people whose duties compel them to pass the greater part of every day at South Kensington. Some of Sir Alexander Stuart's friends are convinced that the typhoid fever which killed him was caught at the exhibition. It is too bad, considering that the profits of these shows are (or ought to be) so great, that the drainage should be reported to be so defective.—London *Truth*.

[We hope that their complaint will not have to be made against the American Exhibition of next year.—ED. ENG. NEWS.]

LIGHTNING RODS AND WATER MAINS.—Several cases have recently been reported in which lightning having struck the water mains of towns, caused their destruction in parts. The latest of these occurrences took place in Halifax, N. S., where lightning struck a fire hydrant, and, notwithstanding the easy path to ground which the mains apparently afforded, tore up the length of two blocks, throwing large rocks to the surface. This shows that it is a dangerous practice to connect lightning rods with the mains and it would be advisable always to look for other means of grounding the rods and to relegate the water pipes to the conduction of currents of low potential.

DENVER, COL.—Several recent cases of serious illness in this city are reported to be the direct result of poisonous water that has been drunk from dirty wells. West Denver furnishes several of these wells, which are very old, and which were never properly finished. The water in them is said to be only surface water, the supply of which is largely added to from the seepage of outhouses. A thick scum is usually found on the water, and it is not improbable that defunct animals repose in the bottoms of such cavities. The police are of the opinion that an inspector should be appointed to look after these poisonous wells which are the source of so many cases of sickness.

IRRIGATION STORAGE.—The practicability of providing at small expense reservoirs sufficient for storing enormous quantities of water for irrigation during the summer is shown by a recent enterprise in Nevada. By the construction of a dam across a narrow cañon in Elko county a reservoir 2,000 acres in extent has been made which, filled to a depth of but 13 feet, contains 8,500,000,000 gallons of water. Twenty-eight miles of ir-

gating ditches have been made, and enough water stored to supply 26,000 acres with all that can possibly be utilized. This serves to show that there are many localities where the construction of storage reservoirs is perfectly feasible at a small outlay, and that in this lies in a large measure the final solution of the water difficulty.

THE National Water-Works Company, of New York City, are spending $800,000 in improvements and extensions of their Kansas City works. The former suburbs of Kansas City, Mo., comprising Kansas City, Kan.; Wyandotte, Riverview, Armstrong, and Armourdale have been consolidated under the name of Kansas City, Kan., and under one municipal government; the National Water-Works Co. now owns the water-works franchise for Kansas City, Mo., and Kansas City, Kan., and hence the expenditure of the above large amount in providing the necessary water supply for the two places.

The improvements in progress call for 7,000 tons of pipe, part of which forms 4 miles of 36-inch conduit and 2¼ miles of 30-inch; there is a series of settling basins—four in number—to be built, with a capacity of 50,000,000 gallons; two pumping engines, of 10,000,000 gallons capacity for low service, and two similar engines for high service; there are also two steel bridges of 420 feet and 132 feet length respectively; the excavation is in clay and amounts to 90,000 cubic yards; the masonry is 14,000 cubic yards. The earthwork and delivery of stone is let by contract; the masonry is being done by the company by days work.

The engineer to design and superintend the construction of the entire work and purchase the pumping engines, is Mr. Geo. W. Pearsons, Mem. Am. Soc. C. E., well-known as a successful hydraulic engineer.

WARSAW, IND.—The water-works were successfully tested and accepted by the city on the 20th. The works consist of: 1. Infiltration well, 25 feet in diameter, near Center lake, with 18 feet depth of water, also direct connection with the lake, 250 feet from pump-house. The lake covers eighty acres and has a large, clear stream flowing out of it. 2. Two compound duplex Worthington pumps, each with a capacity of 1,000,000 gallons per day. Two tubular boilers 60 inches diameter, 16 feet long, made by Sinker, Davis & Co., of Indianapolis. 3. Handsome brick pump-house with engine-room, boiler-room, coal-room, work-shop, office and engineer's living apartments. 4. Stand-pipe, 125 feet high, 6 feet diameter, made by Tippett & Wood. 5. Six miles of pipe, 14-inch suction; 12-inch, 10-inch, 8-inch, 6-inch and 4-inch mains; fifty double-nozzle hydrants; all necessary valves and accessories. J. E. Lewis, of 15 Cortlandt street, New York, was the contractor; Col. S. H. Lockett, Chief Engineer.

BELLEVILLE, ILL.—The City Water Company, which supplies Belleville with many hundred thousand gallons daily, has adopted the Hyatt Pure Water System, and the Newark Filtering Co. is constructing the new plant as rapidly as possible. The apparatus complete will include the coagulators and filters and patent aerator, especially adapted to this system. The latter consists of a stand-pipe 〓 feet high, with appliances for continuously charging the water with 25 per cent. or more of its own bulk of air under pressure. No force pumps or machinery are used, the aerator acting by gravity only. The expense of this aerating apparatus is simply that of construction, there being no subsequent outlay required to keep it in operation, and the filtering company guarantees results. The Hyatt system was adopted by the City Company on the recommendation of Col. S. H. Lockett, C. E., who has made a thorough examination of this system.

GRAND RAPIDS, MICH., WATER SUPPLY.—The annual report of the Board of Public Works, states that the board has done everything possible to procure a better water supply but without avail; and declares that disaster will result unless steps are taken at once in the matter. It is also urged that $30 should be paid to the Water Department for each hydrant. A Boston syndicate recently proposed, through Messrs. S. D. Loring and M. R. Crow, to organize a corporation for the purpose of supplying the city with an ample supply of pure water, and to take up the city's water indebtedness, but the proposition was withdrawn last week. With regard to the quality of the water the Detroit *Free Press* has the following: "Grand Rapids people are leaving daily for seaside resorts, where they may be fanned by refreshing breezes and partake of sea food and fish dinners. It is entirely uncalled for and an unnecessary expense. A glass of water was taken from a Grand Rapids hydrant and examined with a powful microscope. The following luxuries were discovered: A fresh water shrimp with many legs; a trumpet-shaped fellow with a bell on his nose, and a specimen with a horned tail. Lots of other seaside delicacies too numerous to mention were found. And yet Grand Rapids wants chimes in the new city hall tower, and at same time ignores a water supply because it is too expensive."

NEWS OF THE WEEK.

Contracting.

Water Pipes.—The following bids have been received for the new water mains and pipes at Montreal:

	340 tons 24-inch pipe.	180 tons 12-inch pipe.	10 tons 8-inch pipe.	25 tons sp'cl pattern.	Total.
	$	$	$	$	$
E. Chanteloup	.....	.....	.....	50.00	1,250.00
R. McLarin & Co., per Baldwin & Son	30.23	30.23	30.23	53.41	1,460 25
Cooper, Fairman & Co.	31.97	33.45	33.45	70.35	1,753.75
R. N. C. Connal	25.35	26.33	26.62	57.25	.....
Messrs. Gartshore	28.00	23.00	28.00	56.00	.....
Cox & Green	25.95	25.05	25.65	51.75	1,293.75
H. H. Taylor	25.65	25.65	25.65	50.20	1,255.00
Clendinneng & Sons	.....	.....	.....	43.50	.....
Middleton & Meredith	27.00	27.00	27.00	53.50	.....
Messrs. Buckner	27.50	27.50	28.25	50.00	.....
Thomas Turnbull	26.40	26.41	26.41	46.25	.....
Messrs. Bellhouse	25.59	25.59	25.59	50.50	1,262.50
Geo. Dibley & Son	26.36	26.38	26.38	32.50	812.50
Clay, Cross & Co	28.00	.....	.....	51.00	.....

The contract was awarded to Messrs. Geo. Dibley & Son.

New Croton Aqueduct.—The following bids have been received for the construction of crib dock, Shaft No 25, on the west side of Harlem river.

Item.	Quantity.	Ross and Sanford. Price.	Ross and Sanford. Amt.	J. and A. Walsh. Price.	J. and A. Walsh. Amt.	Charles Peterson. Price.	Charles Peterson. Amt.	Jas. D. Leary. Price.	Jas. D. Leary. Amt.	Warren Rosevelt Price.	Warren Rosevelt Amt.	John Gillies. Price.	John Gillies. Amt.	John W. Flaherty. Price.	John W. Flaherty. Amt.	Eng'rs. Estimate. Price.	Eng'rs. Estimate. Amt.
Dredging	cu. yds. 3,000	$ 0.20	$ 600.00	$ 0.35	$ 1,050	$ 0.21	$ 630	$ 0.35	$ 1,050	$ 0.35	$ 1,050	$ 0.45	$ 1,350	$ 0.45	$ 1,350	$ 0.20	$ 600
Cribwork	cu. ft. 36,000	0.05	1,800.00	0.045	1,620	0.06	2,160	0.064	2,304	0 06	2,160	0.075	2,070	.07637	2,750	0.07	2,520
Bridging	ft. B. M. 9,000	44.40	399.60	40.00	360	40.00	360	38.00	342	55.00	495	35.00	315	35.00	315	50.00	450
Loose rock in fill	cu. yds. 600	0.70	420.00	0.65	390	0.50	300	0.65	390	0.65	390	1.00	600	1.00	600	0.30	180
			3,219.60		3,420		3,450		4,086		4,095		4,335		5,015		3,750

The contract was awarded to Charles Peterson, at his bid of $3,450.

Street Paving and Sewers.—The following bids have been received for Belgian block paving in Lancaster, Pa.:

D. & P. McNichol, of Philadelphia; Cape Ann blocks, $3.07 per square yard, and to relay crossings for 25 cents per lineal foot.

R. S. Oster & Bro.; Cape Ann blocks, $3.25 per square foot; with Port Deposit blocks, $3.10. Relaying crossings and repairing blocks at Center square, $20.

Thomas Cunningham, Philadelphia; Cape Ann blocks, $3.69 per square yard; $1.50 per lineal foot for relaying crossings.

John R. Smith & Co.; with Cape Ann or Port Deposit blocks, $4,628.75 for entire work, or $2.41 per square yard.

Thomas C. Wiley; Cape Ann blocks, $2.69 per square foot.

The contract was awarded to T. C. Wiley.

Railroads, Bridges, and Canals.

Erie Canal.—Under the act of the last legislature appropriating $200,000 for the enlargement of five locks on the Erie canal, Superintendent of Public Works Shanahan has awarded the contracts as follows: To Hughes Brothers, of Syracuse, for the work on lock No. 47 at $21,435; lock 48 at $21,301.50 and lock 49, at $16,879; to J. J. McLean of New York for the work on Lock No. 51 at $18,380 and lock No. 52 at $24,755.50. The bids for the Oswego locks will be opened August 2.

Grading, Flagging, Etc.—Bids for street regulating grading, etc., were opened July 14, by the Commissioner of Public Works, New York City. Contracts were awarded as follows: No. 2, First new avenue west of Eighth avenue, W. F. Erving, earth excavation, 60 cents; filling, 20 cents; curb stone; 55 cents; flagging, 24 cents; dry stone culvert, $2; total, $36,876.71. No. 3, Claremont avenue (no award made). No. 4, Fort George avenue, J. H. Sullivan, earth excavation, 27 cents; rock excavation, 95 cents; curb stone, 67 cents; flagging, 31 cents; total, $23,119.40. No. 5, Ninety-first street, J. W. Phelan, earth excavation, $1; rock excavation, $1.25; curb stone, 55 cents; flagging, 30 cents; total, $14,363.75. No. 6, 107th street, John Slattery, rock excavation, $2; filling, 5 cents; culvert, 67 cents; flagging, 24 cents; total, $2,843.51. No. 7, 114th street, Geo. E. Clarke, earth excavation, 30 cents; rock excavation; $1.25; culvert, 50 cents; flagging, 20 cents; total, $16,202.60.

Denver & Rio Grande R. R.—The road has been sold for $15,000,000, and a new company has been organized and incorporated with a capital of $73,500,000. W. S. Jackson, late receiver, is president. A large number of branches and extensions have been decided upon as follows: From Gunnison county to Lake City and Antelope Park; from Hinsdale county to the Las Animas river; from Montrose to Ouray; from Gunnison county to Rico, Durango, and the southern state line; from Española to Santa Fé; from Dillon to the western state line; along Muddy creek to the northern state line; from Meeker along the White river to the western state line; from Wagon Wheel Gap to Cunningham Pass; from Wimenuche creek to Durango; from the Rio Grande river to a point on the railroad between Antonito and Durango, and from Española to Albuquerque and El Paso del Norte.

The New Cruisers.—Recognizing the fact that the new vessels for the navy should be equal to those of other nations and that the greater experience of foreign naval architects and shipbuilders puts this country for a time at a disadvantage, Secretary Whitney announces that the Department has purchased plans abroad, and among others of the latest cruiser built by Sir William Armstrong & Company, the "the Naniwa Kan," and has directed the Bureau of Construction to make such changes in them as would adapt them to our wants without changing motive power or the lines of the vessel. He has decided to make use of these plans, as modified by the Bureau of Construction, for one of the proposed cruisers, and the plans of the Bureau for the other. Mr. Whitney states that this course involves no new departure by the Department, and no reflection upon the skill or zeal of the Bureau officers. It was for years the custom of this Department to rely upon private establishments for machinery designs and this is still the habit of the English Admiralty.

The Hawkesbury Bridge.

The Mechanical World.

Some little time ago we made a statement in these columns to the effect that, though American bridge builders were competing successfully with us in supplying foreign bridges, we had no doubt but that if our own constructors would go in for a more scientific design they could, by reducing weight of material, without any sacrifice of safety but rather the reverse, and by diminishing the cost of labor, so reduce the total cost of bridgework as to easily compete with America. The short statement made by us last week, that the steelwork of the Hawkesbury Bridge being made in England by the celebrated firm of Arrol & Co., tends to establish the accuracy of our reasoning. The Hawkesbury Bridge is being made in Glasgow to American designs. This shows that the Union Bridge Co., who secured the contract, consider they are able to obtain a cheaper bridge in Great Britain than they could at home. It is an ample contradiction to the pessimists who have sung our failing trade, but it is not very flattering to bridge designers in this country, and will no doubt by the wise be taken as evidence of a necessity for reforming our present practice.

Bridge building, like locomotive building, should be a subject of special study, and not be left to the ideas of any railway man to design as he may think fit. In saying this we shall probably tread on the corns of some of the all-wise engineers who consider themselves fit to design anything and everything which appertains to their own branch of engineering, however remotely. Hence, we find railway men traveling over the whole field from culverts to long-span bridges, hydrants to roofs. Engineers who can be good all-round men are very rare.

In the lighter branches of mechanical work the truth of our remarks is every day acknowledged by users of textile machinery, and when a private individual builds a new cotton factory he does not obtain all his machinery from one firm. For preparation machinery he goes to a certain firm well known as makers of this special class; for carding engines he chooses a special maker; for mules he goes to the man of his choice, but for his ring-spinning frames in quite another direction, for he knows that if he goes to one firm for everything, though he can get it, still he cannot get of the best except in the special kind for which that firm is noted. In mills belonging to limited companies this diversity of makers is not found to exist. The reason is simply that upon the directorate may be found grocers, tailors and other non-technical men who cannot appreciate the differences known to the practical man. So we have the oculist and the aurist in the medical profession. Why not, then, the specialist work, as they have in America?

Contractors Intelligence,

Reported by T. H. Boorman.

Engineering and Building Materials.

WHOLESALE PRICES.

New York July 29, 1886.

IRON.

STRUCTURAL IRON.			
Angles	2.00c	@	2.10c
" steel	2.35	@	2.45
Tees	2.40	@	2.45
Beams and channels, American	3.0	@	
Tank plates	2.10	@	2.20
Shell plates	2.4	@	2.5
Steel plates, Tank	2.70	@	2.75
WROUGHT-IRON PIPE. PITTSBURG.			
Butt welded, black Discount			45
" galvanized "			35
Lap welded, black "			60
" galvanized "			42½
Boiler tubes "			52½
RAILS.			
Steel (large lots at mill)	$34.00	@	$35.00
Old rails	18.50	@	18.75
Old rails, steel	22.00	@	23.00
R R. spikes			2.40c
R R. splice-plates	1.80	@	2.00
R R. track bolts, square nuts	3.00		
Barb-wire fencing, galvanized	4.38		
" painted			4.00
Corrugated Iron			
Nails			
Iron, per keg	2.10	@	2.20
Steel do.	2.55	@	2.60

METALS.

COPPER.			
Lake Superior	9.75	@	10.00
Other Brands	9.00	@	9.50
LEAD.			
Com. Domestic	4.85	@	4.90
Lead Pipe	.06¼c.		
Tin-Lined Lead Pipe	.15		
Sheet Lead	.07¼		
ZINC.			
Sheet	$5.70	@	5.65

BRICK.

Cargoes (afloat)			
Choice Brands	7.50		
Haverstraw per M.	6.25	@	7.00
Fishkill	7.00		
Up-River	6.00	@	6.50
Jerseys	5.50	@	6.00
Long Island			
Pale	4.50	@	4.75
FRONTS.			
Croton, red	11.00	@	15.00
" dark	11.00	@	15.00
" brown	10.00	@	14.00
Philadelphia pressed	27.00	@	28.00
Trenton "	25.00	@	26.00
Baltimore "	37.00	@	41.00
Buff "	33.00	@	35.00
Enameled English	85.00	@	130.00
" American	80.00	@	130.00
Fire brick	25.00	@	55.00
" American, No. 1	30.00	@	35.00
" " No. 2	25.00	@	30.00

ASPHALT.

ROCK.			
French	$20.00	@	25.00
German	15.00	@	20.00
According to quantity or brand, and whether taken from vessel or store.			
PAVEMENT.			
Barber's Asphalt	$2.50	@	$3.00

LIME.

Rocklock Cement Co.'s Ground	.80
Rockland, common per bbl	1.00
" finishing	1.20
State, common	.85
" finishing	1.15
Kingston, ground	.90
Add 25c. to above figures for yard rates.	

STONE.

Cargo rates at New York.

Amherst freestone, No. 1 per cub. ft.	0.95	@	1.00
" " No. 2 "	0.75	@	0.85
" " light drab "	0.80	@	0.95
Berlin " in rough "	0.75	@	1.00
Berea " " "			
Brown stone, Portland, Ct. "	1.00	@	1.35
" Belleville, N. J. "	0.75	@	1.35
Granite, rough	0.45	@	1.25
Common building stone per load	2.00	@	3.00
Base stone, from 2½ to 6 ft. lengths, per lin. ft.	0.40	@	3.00
Concrete and macadam stone, Tomkins Cove, per cub. yd			$1.65

SLATE.

Purple roofing per square	6.00	@	7.00
Green "	6.00	@	7.00
Red "	15.00		
Black Penna. (at New York) "	4.50	@	5.00

LUMBER.

Prices for yard delivery in New York.

PINE, Common box per M.	18.00	@	20.00
Choice "	65.00	@	70.00
Tally plank, 1¼ in. to 1½ in. dres'd. each,	.44	@	.50
Tally boards, dressed com. "	.28	@	.30
SPRUCE, Boards dressed "	.25	@	.28
Plank, 1¼ in "	.28	@	.30
" 2 in. "	.38	@	.40
" 2½ in. dressed "	.43	@	.45
Timber per M.	13.00	@	16.00
HEMLOCK, Boards each.	.18	@	.20
Joist, 2½ × 4 to 4 × 6 in	.16	@	.44
OAK per M.	55.00	@	65.00
CYPRESS 1, 1¼, 2 and 2½ in "	35.00	@	40.00
YELLOW PINE, Girders "	25.00	@	30.00
Dressed flooring "	28.00	@	35.00
SHINGLES, Extra shaved pine, 16in. "			
" sawed 18 in. "	5.75	@	6.00
LATH, Cargo rate "	2.00	@	2.10

PAINT.

Lead, white, American dry per lb	.04¾	@	.06¾
" " in oil pure "	.07	@	.07½
" English, B. B. in oil "	.08¼	@	.08¾
" Red, American "	.06¾	@	.07
Litharge "	05½	@	.06
Venetian red, American "	.01	@	.01¼
Indian red "	.08	@	.10
Vermillion, American lead "	.10½	@	.11½
Paris green "	.15	@	.18
Umber, Amer. raw and powdered per lb.	.01¼	@	.01¾
Drop black, Amer. "	.07	@	.16
" Eng. "	.11	@	.13
Chrome green	.10	@	.25
Oxide zinc, American "	.03¾	@	.05½
" French "	.06½	@	.07½

CEMENT.

The following price current is made up entirely from quotations furnished us directly by the firms dealing in each brand; the prices are understood to be wholesale in New York, subject to such special rates as large quantities may warrant:

CALVIN TOMKINS:			
"Old Newark Co's." Cement			$1.10
BAETJER & MEYERSTEIN:			
Hanover Port.and	$2.60	@	$2.65
BELLONI & Co.:			
Hemmoor "Crown" brand			2.50
JAMES BRAND:			
Burham	2.25	@	2.50
Fewen	2.25	@	2.50
BROOKS, SHOOBRIDGE & Co.	2.45	@	2.60
HOWARD FLEMING:			
Gibbs' English Portland, 400 lbs.	2.50	@	2.75
K. B. & S. " "	2.25	@	2.50
Stettiner, German	2.65	@	2.85
Lagerdorfer, "	2.45	@	2.75
Fleve, A 1, Belgian	2.35	@	2.50
Roman	2.75	@	3.00
Keene's Coarse	4.75	@	5.50
" Fine	7.75	@	8.50
" Superfine	8.50	@	10.00
FISHER, ERSKINE W.:			
Stettin (German) Portland Cement	2.40	@	2.75
GABRIEL & SCHALL:			
Vorwohler "Lion"	2.65	@	3.10
HUDSON RIVER CEMENT Co. Rosendale			0
JOHNSON & WILSON:			
Saylor's American Portland	2.15	@	2.45
LESLEY & TRINKLE, Philadelphia, Pa.:			
"Giant" Portland	2.20	@	2.40
Improved "Union"	1.25	@	1.50
Union	1.10	@	1.20
MARCIAL & Co.:			
J. B. White & Bros. Coarse Keene's	4.25	@	4.50
" Superfine	7.25	@	7.50
" Portland	2.65	@	3.00
NEW YORK CEMENT Co.:			
Rosendale			1.10
N. Y. & ROSENDALE CEMENT Co.:			
Rosendale, "Bridge" brand			1.10
SINCLAIR & BABSON:			
Alsen's Portland Cement Works	2.35	@	2.85
K. B. & S.	2.25	@	2.50
STANDARD CEMENT Co			
E. THIELE:			
Dyckerhoff	2.90	@	3.25
UNITED STATES CEMENT Co.:			
English Portland	2.25	@	2.40
German "	2.00	@	2.15
Standard	1.50	@	1.65
Windsor and Improved Rosendale	1.00	@	1.10
UNION AKRON CEMENT Co.:			
Akron "Star" brand	1.00	@	1.10

BUILDING ITEMS.

Engineer Kellogg of the Park Department is preparing estimates for the repair of the sea wall at the Battery, for which needed improvement the Commissioners hope to receive an appropriation of about $20,000.

Architect Debevoise of the School Board is busy in perfecting plans for the proposed buildings and is having new ones prepared for some.

All the new buildings will be four stories, with a basement and cellar. The Cannon street school is to cost $90,000; the one at Ninety-sixth street and Lexington avenue, $130,000; the West 134th street one, $125 000; Grammar School No. 46, in 156th street, 80,000; Grammar School No. 54, in 104th street, $60,000; the colored school in the Twentieth ward $40,000; the West Forty-first street school $60,000; the West Sixty-first street school, $120,000; the High Bridge school, $30,000, and the new building for the Twenty-third Ward Trustees, on 138th street, $120,000.

Mr. R. Rosenstock has drawn plans for the Yorkville Lutheran congregation for a new church with Sunday School room, etc., to be built on the south side of Eighty-fourth street between First and Second avenues.

Mr. Andrew Lester, 730 Broadway, will build eight stores, with a dwelling over the corner stores, on Madison avenue, Fifty-sixth and Fifty-seventh streets, 75 x 200; Mr. N. Gillesheimer, 291 Broadway, is the architect.

Messrs. Lamb & Rich are preparing plans for a five story brick and stone tenement house, 100 x 100, to be built for Mr. R. Waldo on the north east corner of Second avenue and Eighty-ninth street.

At Nos. 140 and 142 Tenth avenue, two tenements, 17.8 x 88, and 27.8 x 88, are to be built for Mr. Frederic Bronson, at a cost of $31,000, from plans of Mr. Richard M. Hunt.

Plans have been filed for the Sloane Maternity Hospital to be built on the northeast corner of Tenth avenue and Fifty-ninth street, Mr. W. Wheeler Smith, architect; J. J. Tucker and A. C. Hoe & Co., builders.

The Calvary Baptist church on West Fifty-seventh street is to have improvements made at a cost $20,000 from plans of Mr. J. R. Thomas; F. Schactler, builder. The Broadway and Seventh avenue Railroad stables on Fifty-first street, are to have improvements made to cost $40,000. Mr. Stephen D. Hatch, architect, who has also plans for improvements to be made to the Comedy Theatre.

Messrs. Young & Cable report plans on the boards for a four story brick, terra cotta and iron store, 37 x 100, to be built for Mr. Winfield S. Spencer and a three story brick and stone store, 40 x 90, to be built by Mr. George Ferguson, both at New Rochelle, also a cottage to be built at the same place for Mrs. George Douglas.

At Long Branch the corner stone of St. Michaels church on Ocean avenue, was laid this week, the building will cost $40,000 the Rev. Jas. A. McFall is pastor.

The Alex. Smith's Sons Carpet Company of Yonkers have given out a contract for another new building, 86 x 150, on Nepperhan avenue.

The Public Buildings Committee on Tuesday reported the bill increasing to $680,000 the cost of the Public Building at Minneapolis.

BOSTON, MASS.—Messrs. Johnston & Potter will erect twenty first-class residences on land just purchased by them on the corner of Cumberland & St. Botolph street from plans of architect Fred Pope.

Messrs. Pray & Sons carpet store is to be enlarged, to cover the entire block bounded by Washington street, Harrison avenue, Norfolk and Chickering places; plans for the enlargement were prepared by the late Mr. H. H. Richardson.

Mr. J. B. Snook is the architect for a building, 48 x 48.6, to be built on the southeast corner of Thirty-eighth street and Seventh avenue, for Mr. Jno. G. Wendell. Mr. Chas. W. Clinton has on the boards designs for a handsome residence to be built for Mr. J. E. Knapp, at Orange, N. J.

The contract for the super-structure of the Market street bridge Philadelphia, has been awarded to Messrs. Cofrode & Saylor of that city, who have also the contract for building all the bridges of the Piedmont and West Virginia railroad.

A great deal of interest was felt in the decision of Judge Barrett in the matter of the permit requested by Mr. John J. Tucker to erect a seven story building without fireproof construction.

The Judge, in a written opinion, says;

"The law is explicit as to the necessity of fireproof construction. To obtain an exception to that iron-clad rule both the superintendent and the examiners must concur upon the whole, and in view of the opinions expressed by some of the examiners themselves as a justification of their vote, I feel constrained to withhold the discretionary writ of mandamus. The application must be denied."

MARKET SUMMARY.

The brick market shows little fluctuation. The closing of twelve of the thirteen yards at Verplanck on account of labor troubles, may cause a rise in prices in the near future. Arrivals of Haverstraws have been full but the demand has been fully equal to supply; the aqueduct takes large quantities of the best quality. Pale brick is in good demand. Long Islands are not shipped to this market at this season of the year, ready sale being found for them in the eastern markets. Fire bricks are in excellent demand, one factory reports it impossible to deliver as fast as orders come in. Rosendale cement manufacturers are feeling the effect of their "off season month" and have shaded prices on immediate deliveries, sales having been made at 90 cents per barrel for ordinary brands and at $1.00 for extra brands, price of the latter, however, cannot be quoted at less than $1.10 per barrel. Portland cement moves briskly and importers of popular brands have no fear of having to store, as, though importations are large, the demand is constantly increasing: the Standard Oil Co's mammoth hotel in Florida gave an order for 20,000 barrels this season.

Laths are in fair demand, and St. John have been sold at $2.10; the market, however, cannot be quoted over $2 to $2.10 and sales of Maine lots have been made at $1.90 per barrel.

The Paint and Oil market is quiet, Linseed oil however is much firmer and sells at 43 to 45 cents per gallon for raw, 46 to 48 cents for boiled. Turpentine is quoted 36 cents to 37 cents per gallon. American Red Lead has advanced to 6½ @ 7 cents per pound and Litharge will probably be higher in price. Lime hardly arrives as fast as consumers require it, prices being steady at $1.00 and $1.20 for Rockland, 85 cents and $1.05 per barrel for State. Tin plates show little variation. Zinc is a trifle firmer.

The Iron and Steel Industries.

The semi-annual statistical statement of the American Iron and Steel Association shows that the production of pig iron in the first six months of 1886 amounted to 2,954,209 tons of 2,000 pounds, or 2,637,687 tons of 2,240 pounds. The country has never before produced as much pig iron in the same time. Prior to 1879 it never produced as much pig iron in a whole year, and the production of 1879 was only 116,666 net tons greater than that of the first half of this year. The greatest absolute gain in production in the first half of 1886 as compared with the last half of 1885 was made by Pennsylvania, but among the States which are prominent in the production of pig iron, the greatest relative gain was made by Ohio and Alabama, each of which greatly increased its production. The stocks of pig iron on hand and unsold in the hands of makers or their agents at the close of the first half of 1886 amounted to 470,421 net tons, which was a slight increase on the quantity held in stock at the beginning of the year, namely 416,512 tons.

The production of Bessemer steel ingots in the first half of 1886 amounted to 1,073,693 net tons, against 938,419 tons in the second half of 1885 and 763,344 tons in the first half of 1885. The production of Bessemer steel rails in the same period amounted to 707,447 net tons, against 622,163 tons in the second half of 1885, and 453,446 tons in the first half of 1885. The production of open-hearth steel rails was only nominal, amounting to 952 net tons. This country, the report concludes, will make more Bessemer steel, Bessemer steel rails, and more open-hearth steel in 1886 than in any previous year.